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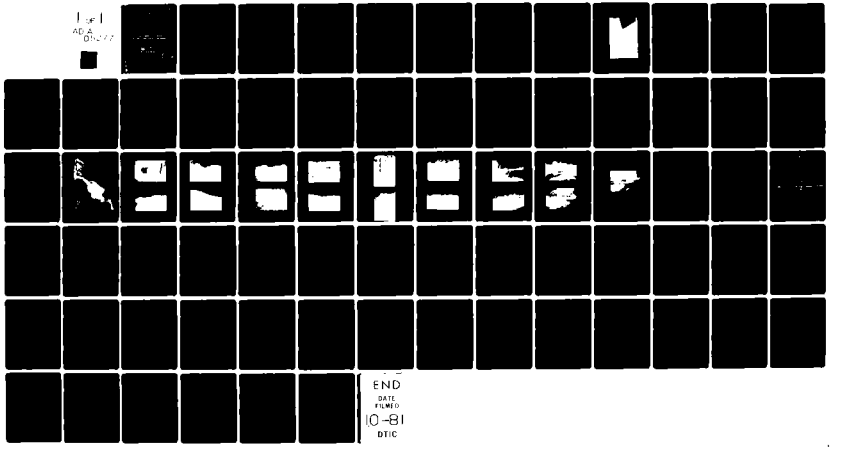

LEVEL II

MISSOURI - KANSAS CITY BASIN

AD A105277

TANNER LAKE DAM

RAY COUNTY, MISSOURI

MO. 11230

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
... Serving the Army
... Serving the Nation

St. Louis District

PREPARED BY: U.S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

JULY, 1980

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

TANNER LAKE DAM
RAY COUNTY, MISSOURI
MISSOURI IDENTIFICATION NO. MO 11230

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY
HOSKINS-WESTERN-SONDEREGGER, INC.
CONSULTING ENGINEERS
LINCOLN, NEBRASKA

UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

July, 1980

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

SUBJECT: Tanner Lake Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Tanner Lake Dam (MO 11230).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

a. Spillway will not pass 50 percent of the Probable Maximum Flood without overtopping the dam.

b. Overtopping of the dam could result in failure of the dam.

c. Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: _____ 2 DEC 1980
Chief, Engineering Division — Date

APPROVED BY: _____ 2 DEC 1980
Colonel, CE, District Engineer — Date

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM
ASSESSMENT SUMMARY

Name of Dam	Tanner Lake Dam
State Located	Missouri
County Located	Ray County
Stream	Tributary to Cravens Creek
Date of Inspection	July 2, 1980

Tanner Lake Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderegger, Inc. The purpose of the inspection was to make an assessment of the general conditions of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers.

Tanner Lake Dam has a height of twenty-nine (29) feet and a storage capacity at the minimum top elevation of the dam of one hundred-five (105) acre-feet. In accordance with the guidelines, a small size dam has a height greater than or equal to twenty-five (25) feet but less than forty (40) feet and a storage capacity greater than or equal to fifty (50) acre-feet but less than one thousand (1,000) acre-feet. The size classification is determined by either the storage capacity or height, whichever gives the larger size category. Tanner Lake Dam is classified as a small size dam.

In accordance with the guidelines and based on visual observation, the dam is classified as having a high potential for damage and loss of life. Failure would threaten life and property. The estimated damage zone extends approximately three (3) miles downstream of the dam. Within the damage zone are a dwelling and a building (0.7 miles downstream), three dwellings and two barns (2.7 miles downstream), and seven dwellings and a house trailer (2.9 miles downstream).

Our inspection and evaluation indicate that the spillways do not meet the minimum criteria set forth in the recommended guidelines for a small dam having a high hazard potential. In consideration of the small volume of water impounded and the size of the downstream floodplain 50 percent of the Probable Maximum Flood is the appropriate spillway design flood. The spillways will pass the 100-year flood (a flood having a 1 percent probability of being exceeded in any year) without overtopping the dam. The spillways will pass 20 percent of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

Design data was available for this dam from the Soil Conservation Service. Based on the design data and the field inspection of the dam the following remedial measures should be implemented by the owner on a high priority basis:

a. All trees and brush should be removed from the embankments and crest of the dam and from the emergency spillway.

b. Following the removal of trees and brush from the dam and the emergency spillway another inspection based on the "Recommended Guidelines for Safety Inspection of Dams" should be made. Remedial measures that may become apparent based on this inspection, and which are not covered in this report should be incorporated in the work to be done by a professional engineer.

c. The spillway size and/or the height of the dam should be increased in order to pass 50 percent of the probable maximum flood without overtopping the dam. Spillway capacity could be increased either by enlarging the existing emergency spillway or by construction of an additional spillway through the left abutment.

The following operation and maintenance procedures are recommended and should be implemented by the owner:

a. Seepage and stability analyses comparable to the requirements of the recommended guidelines should be performed by an engineer experienced in the design and construction of dams.

b. After the remedial measures recommended above are accomplished a program of periodic inspection and regular maintenance should be initiated in order to control tree and brush growth and to make minor repairs.

c. Records of inspections should be made a part of this project file.

Rey S. Decker
E-3703

Gordon Jamison

Garold Ulmer
E-19246

H. P. Hoskins
Harold P. Hoskins, Chairman of the Board
Hoskins-Western-Sonderegger, Inc.
E-8696

PHOTO NO. 1 - OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TANNER LAKE DAM - MO 11230
RAY COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367 authorized the Secretary of the Army through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Tanner Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams," dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth fill approximately 700 feet in length and 29 feet high. The maximum water storage at the minimum top elevation of the dam is 105 acre-feet. This site is located in the rolling loess-till hill area north of the Missouri River. Minimal design assistance was provided by the Soil Conservation Service, Richmond, Missouri under the Public Law 46 program for dam ponds, gully control and other small dams partially funded by ASCS.

(2) The principal spillway is uncontrolled and consists of a 20-inch diameter welded steel pipe that passes through the dam. The inlet end is equipped with a hood.

(3) An uncontrolled, vegetated earth emergency spillway is cut through the right abutment. It has a bottom width of about 30 feet and side slopes of 1V on 3H.

(4) Pertinent physical data are given in paragraph 1.3 below.

b. Location. The dam is located in the south central portion of Ray County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the SW¼ of Section 10, T51N, R28W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Tanner Lake Dam has a height of 29 feet and a storage capacity of 105 acre-feet. This dam is classified as a small size dam. A small size dam has a height greater than or equal to 25 feet but less than 40 feet and a storage capacity greater than or equal to 50 acre-feet but less than 1,000 acre-feet. The size classification is determined by either the storage or height, whichever gives the larger size category.

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on referenced guidelines, this dam is in the High Hazard Potential Classification. The estimated damage zone extends about three miles downstream of the dam. Within the damage zone are a dwelling and a building (0.7 mile downstream), three dwellings and two barns (2.7 miles downstream), and seven dwellings and a house trailer (2.9 miles downstream).

e. Ownership. The dam is owned by Mr. Oswald A. Tanner, Rt. #2, Richmond, Missouri 64085.

f. Purpose of Dam. The dam was constructed for erosion and gully control.

g. Design and Construction History. The dam was surveyed and designed by the Soil Conservation Service, Richmond, Missouri. It was reported by Mr. Tanner that he began construction of the dam in 1966. The principal spillway pipe was laid and the dam built up to the main hollow or stream. The main core was left open over the valley. Mr. Tanner was unable to finish the dam the following years due to his own personal work and wet weather. Finally, a friend of Mr. Tanner's finished the construction of the dam in 1974.

h. Normal Operating Procedure. There are no operating facilities for this dam. The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillways.

1.3 PERTINENT DATA

a. Drainage Area. 165 acres (0.258 square miles).

b. Discharge at Damsite.

(1) All discharges at the damsite are through a 20-inch welded steel pipe with hooded inlet and through an uncontrolled, vegetated earth emergency spillway.

(2) Estimated maximum flood - It was reported by Mr. Tanner that water flowed through the emergency spillway in the spring of 1975 due to the principal spillway being plugged with ice. Depth of water in the spillway at that time is not known.

(3) The principal spillway capacity varies from 0 c.f.s. at elevation 100.4 feet to 48 c.f.s. at the crest of the emergency spillway (elevation 103.4 feet) to 50 c.f.s. at the minimum top of dam (elevation 105.4 feet).

(4) The emergency spillway capacity varies from 0 c.f.s. at its crest (elevation 103.4 feet) to 260 c.f.s. at the minimum top of dam (elevation 105.4 feet).

(5) Total spillway capacity at the minimum top of dam is 310 c.f.s. ±.

c. Elevations (feet).

(1) Observed pool - 98 ±

(2) Normal pool - 100.4

(3) Spillway crest (s)

Principal - 100.4

Emergency - 103.4

(4) Maximum experienced pool - 103.4 +

(5) Top of dam (minimum) - 105.4

(6) Maximum Tailwater - Unknown

(7) Streambed at Centerline - 76 ±

d. Reservoir.

(1) Length (feet) of pool at top of dam - 1,400 ±

(2) Length (feet) of pool at principal spillway crest - 1,000 ±

(3) Length (feet) of pool at emergency spillway crest - 1,240 ±

e. Storage (Acre-feet).

(1) Observed pool - 54 ±

(2) Normal pool - 65 ±

(3) Spillway crests

Principal - 65 ±

Emergency - 87 ±

(4) Maximum experienced pool - 87 ±

(5) Top of dam (minimum) - 105 ±

f. Reservoir Surface (Acres).

(1) Observed pool - 5.7 ±

(2) Normal pool - 6.8

(3) Spillway crests

Principal - 6.8

Emergency - 8.2

(4) Maximum experienced pool - 8.2 +

(5) Top of dam (minimum) - 9.3 ±

g. Dam.

(1) Type - Earth fill

(2) Length - 700 feet

(3) Height - 29 feet ±

(4) Top width - 12 feet ±

(5) Side slopes.

(a) Downstream 1V on 2H (plans); 1V on 3H (field measurement)

(b) Upstream 1V on 3H (plans); 1V on 4H (field measurement)

(6) Zoning - None

(7) Impervious core - Homogeneous section

(8) Cutoff - 10 ft. bottom width with 1V on 1H side slopes and varying in depth from 4 to 10 ft. (plans). Mr. Tanner said the core bottomed in clay.

(9) Grout curtain - None

(10) Wave protection - Vegetated berm, 8 ft. wide

(11) Drains - None

h. Diversion Channel and Regulating Tunnel. None

i. Spillway.

(1) Principal

(a) Type - Uncontrolled, 20-inch diameter welded steel pipe with hooded inlet and anti-vortex device passing through the embankment.

(b) Crest (invert) elevation - 100.4

Outlet - 77.5

(c) Length - 98 ft. ±

(2) Emergency

(a) Type - vegetated earth, uncontrolled, cut through the right abutment and having a bottom width of 30 feet and side slopes of 1V on 3H.

(b) Control section - A level section near the centerline of the dam.

(c) Crest elevation - 103.4

(d) Upstream Channel - Unknown

(e) Downstream Channel - Parallel with downstream toe of dam.

j. Regulating Outlets. None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Design data were available for this dam from the SCS office in Richmond, Missouri. Copies of the plans and construction notes are included in Appendix C.

2.2 CONSTRUCTION

No construction data were available. It was reported by Mr. Tanner that he started construction of the dam in 1966 and that it was completed by a friend in 1974.

2.3 OPERATION

No data were available on spillway operation. It was reported by Mr. Tanner that the emergency spillway operated once since construction. There was flow through the emergency spillway in the spring of 1975, due to the principal spillway being plugged with ice.

2.4 EVALUATION

a. Availability. All data in the Richmond SCS office were readily available.

b. Adequacy. The plans supplied by SCS and the limited visual observations presented herein are considered adequate to support the conclusions of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. All available information and reports on construction control are considered to be valid.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the Tanner Lake Dam was made on July 2, 1980. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska making the inspection were: R.S. Decker, Geotechnical; Garold Ulmer and Gordon Jamison, Hydrology and Hydraulics. Mr. Oswald Tanner was interviewed prior to inspecting the dam; however, Mr. Tanner was not present during the time of the inspection.

b. Dam.

(1) Geology and Soils (abutment and embankment). Tanner Lake Dam is located in the dissected till plains area within the Central Lowlands Physiographic Region. The dam site is in a region where the stratigraphic sequence consists of loess, 5 to 15 feet thick, overlying Kansan-age glacial drift, of undetermined thickness and character, which in turn overlies bedrock. Bedrock underlies the entire site at an undetermined depth and consists of strata assigned to the Marmaton Group, Demonsian Series, Pennsylvanian System. Strata of this group is comprised of interlayered sequences of shale, sandstone, limestone and thin coal seams.

The upland soil deposits in the dam area consist of soils of the Marshall-Knox soil association. These soils formed on the deep loess deposits that lie adjacent to the Missouri River flood plain. The Marshall soil is positioned on the gently sloping areas while the Knox soil is positioned in the upland valley areas.

Materials in the dam apparently consist of CL and CL-ML soils borrowed from the reservoir area and gully banks (abutments). No glacial till nor bedrock was observed at the site.

(2) Upstream Slope. The upstream slope is entirely covered with locust trees, brambles and other brush. Vegetation was so dense and thorny that it was not possible to make any accurate measurements or many observations. There did not appear to be any serious erosion along the water line of the dam. One very rough measurement showed the upstream slope to be about 1V on 4H. Photos No. 7, 8, 9 and 14 show the upstream slope.

(3) Crest. About 85% of the crest is completely covered with locust (thorn) trees and brush, so dense that it was impossible to traverse the crest. One rough measurement showed the crest to be 13 to 14 feet in width. The left end of the crest is open and well vegetated with grass. Materials on the crest were CL-ML soils. Photos No. 2, 3, 4, 7, and 8 show the crest.

(4) Downstream Slope. The downstream slope is covered with locust trees and other brush. The area along and downstream from the toe to the right of the pipe spillway was quite seepy. Mr. Tanner said he thought this seep was caused by the outlet of an old tile line. The few observations that could be made showed no indications of boils or piping along the toe. It was not possible to determine the physical characteristics of the downstream slope. Photos 4, 5 and 6 show the downstream slope.

(5) Miscellaneous. The dense cover of locust trees and other brush made it impossible to make many pertinent observations on the condition of this structure.

c. Appurtenant Structures.

(1) The principal spillway is uncontrolled. It consists of a 20-inch welded steel pipe with a hooded inlet and anti-vortex device. No signs of deterioration were noted in the inlet or outlet of the conduit. Measurements could not be taken to determine whether or not it was constructed according to plans. Photos No. 10, 11 and 12 show the inlet and outlet of the principal spillway. There was no flow through the spillway at the time of inspection. The reservoir level was about 2 feet ± below the invert of the principal spillway at the time of inspection.

(2) Emergency Spillway. According to the plans, the emergency spillway is cut through the right abutment. This area, shown in Photo No. 2, is so densely overgrown with locust trees and brush that it was not possible to recognize the spillway.

(3) Drawdown Facilities. There are no drawdown facilities for this dam.

d. Reservoir Area. No significant erosion was observed around the shoreline. The shoreline supports a lush growth of tules and grasses. Photos 9 and 14 show portions of the reservoir. Mr. Tanner reported that there were springs in the reservoir area.

e. Downstream Channel. The downstream channel is heavily overgrown with trees and brush. Photo No. 13 shows the channel.

3.2 EVALUATION

The very rough measurements that could be made indicate that the dam cross section is equal to or exceeds that shown on the plans. It is not possible to adequately inspect this dam until the trees and brush have been removed. The heavy growth of trees and brush on all surfaces of the dam and in the emergency spillway could cause potential of failure of this dam unless removed.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam. The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillways.

4.2 MAINTENANCE OF DAM

Due to the heavy overgrowth of locust trees and brushy vegetation on all surfaces of the dam as well as in the emergency spillway it would appear that there has been very little maintenance done since the construction of the dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect for this dam.

4.5 EVALUATION

The dense overgrowth of trees and brush in the emergency spillway reduces the capacity of the spillway from 20% of the probable maximum flood as shown in Section 5 to an unknown volume of flow. The lack of maintenance could cause potential of failure of this dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Plans for this dam were obtained from the Soil Conservation Service office in Richmond, Missouri. The plans are included in Appendix C.

b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Camden, Missouri 15 minute topographic quadrangle map and the SCS plans. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data from the SCS plans.

c. Visual Observations.

(1) Heavy tree and vegetative growth made the inspection of the dam almost impossible. Accurate field measurement could not be taken.

(2) The principal spillway pipe and anti-vortex device appeared to be in good condition.

(3) The emergency spillway was heavily overgrown with vegetation and trees.

d. Overtopping Potential. The spillways are too small to pass 50 percent of the probable maximum flood without overtopping. The spillways will pass 20% of the probable maximum flood and the 1% probabilistic flood without overtopping the dam. Overtopping is dangerous because the flow of water over the crest will erode the face of the dam and, if continued long enough, will breach the dam with sudden release of all of the impounded water into the downstream floodplain.

The results of the routings through the dam are tabulated in regards to the following conditions:

Frequency	Inflow Discharge c.f.s.	Outflow Discharge c.f.s.	Maximum Pool Elevation	*Maximum Depth Over Dam-Ft.	Duration Over Top Hours
1/2 PMF	2,330	1,850	106.3	0.9	1 ±
PMF	4,660	3,720	106.9	1.5	5 +
0.20 PMF	930	290	105.3	---	---

* Minimum Top of Dam Elevation - 105.4

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the 1/2 PMF to the PMF is the test for the adequacy of the dam and its spillway.

The estimated damage zone is described in Paragraph 1.2d in this report.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation. The few rough measurements and observations that could be made would indicate that the dam should be stable against shear failures. There were no indications of adverse effects of seepage on the stability of the dam. An adequate visual inspection of the dam cannot be made until the dense overgrowth is removed.

b. Design and Construction Data. Design data and reports on construction are considered adequate to support the conclusions in this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Operating Records. There are no controlled operating facilities for this dam.

d. Post Construction Changes. The inspection team is not aware of any post-construction changes.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. It would appear that this dam does not have a serious potential of failure. Hydrologic analyses presented in this report indicate that the spillways will pass the 1% probability flood and 20 percent of the probable maximum flood without over topping the dam. Clearing trees and brush from the emergency spillway should improve the hydraulic efficiency of the spillway. All trees and brush should be cleared from the structure to facilitate adequate inspection and prevent future impairment of the integrity of the dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

b. Adequacy of Information. The conclusions in this report are based upon data furnished by the Soil Conservation Service, performance history of the dam and the very limited amount of data that could be gathered during the field inspection of the dam. The almost complete overgrowth of both embankments as well as the crest (as shown in the photographs) defied attempts made to conduct profile and cross section surveys. Evidence of cracking, sloughing, settlement, misalignment, erosion or rodent activity normally observed in the field inspection of a dam could not be adequately observed because of the dense overgrowth. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency. The remedial measures recommended in paragraph 7.2a(3) should be pursued by the owner on a high priority basis.

d. Necessity for Further Investigations. Further investigations, based on "Recommended Guidelines for Safety Inspection of Dams", should be conducted after the removal of the overgrowth from the embankments and crest of the dam and from the emergency spillway. Remedial measures in addition to those recommended in paragraph 7.2a may become apparent based on these further investigations.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam. It is recommended, however, that the prescribed seismic loading for Seismic Zone 1 be applied in any stability analyses performed for this dam.

7.2 REMEDIAL MEASURES

The following remedial measures and maintenance procedures are recommended. All remedial measures should be performed under the guidance of a registered professional engineer experienced in the design and construction of earth dams.

a. Alternatives.

(1) All trees and brush should be removed from the embankments and crest of the dam and from the emergency spillway.

(2) Following the removal of trees and brush from the dam and the emergency spillway another inspection based on the "Recommended Guidelines for Safety Inspection of Dams" should be made. Remedial measures that may become apparent, based on this inspection, and which are not covered in this paragraph should be incorporated in the work to be done by the professional engineer.

(3) The spillway size and/or the height of the dam should be increased in order to pass 50 percent of the probable maximum flood without overtopping the dam. Spillway capacity could be increased either by enlarging the existing emergency spillway or by construction of an additional spillway through the left abutment.

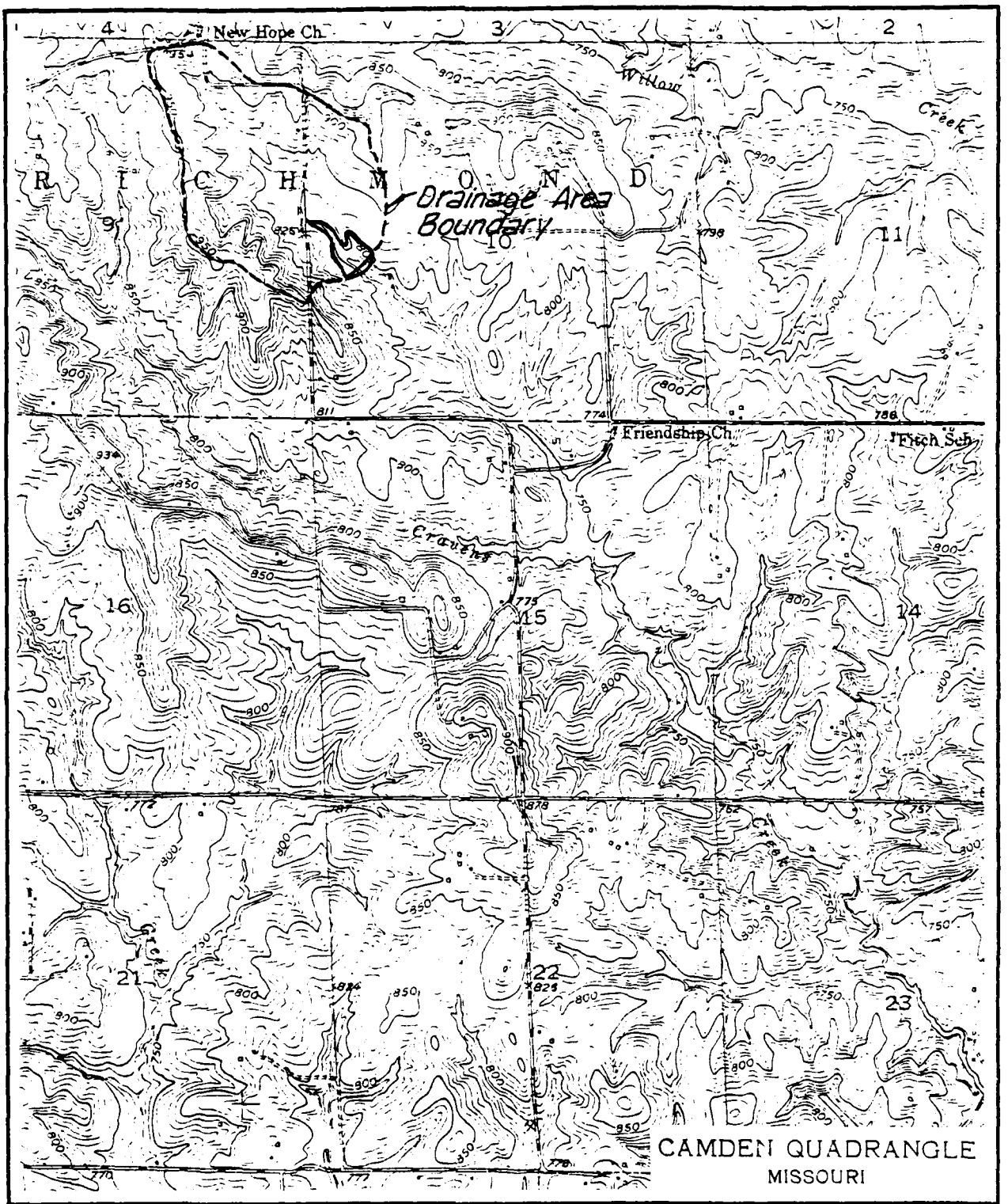
b. Operation and Maintenance Procedures.

(1) Seepage and stability analyses comparable to the requirements of the recommended guidelines should be performed by an engineer experienced in the design and construction of dams.

(2) After the remedial measures recommended in paragraph 7.2a are accomplished a program of periodic inspection and regular maintenance should be initiated in order to control tree and brush growth and to make minor repairs.

(3) Records of inspections should be made a part of this project file.

APPENDIX A
MAPS



Scale in feet

2000 1000 0 2000 4000

Contour Interval – 10'

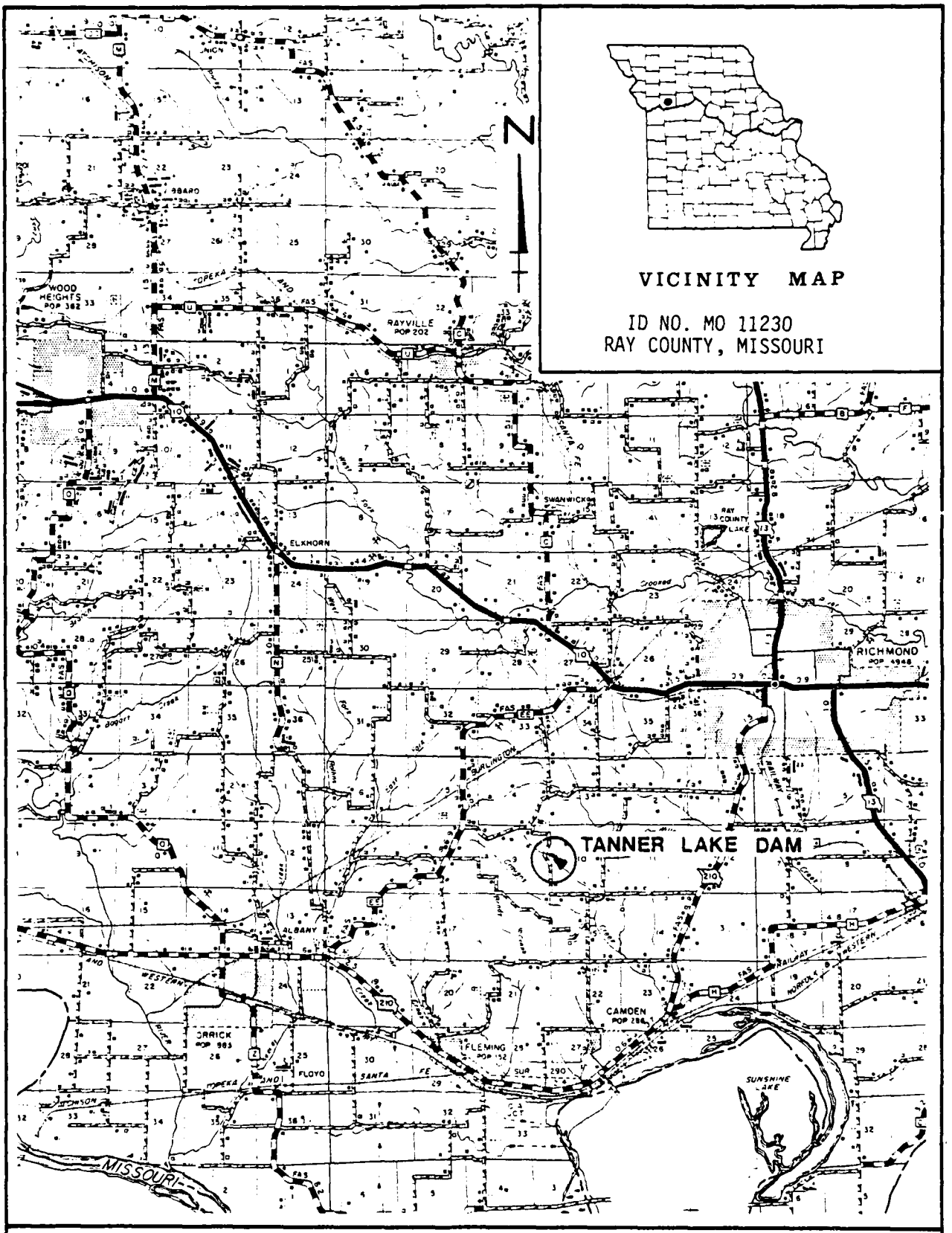
N

VICINITY TOPOGRAPHY

TANNER LAKE DAM

RAY COUNTY, MISSOURI

MO. 11230 PLATE A-1



LOCATION MAP

PLATE A-2

APPENDIX B
PHOTOGRAPHS

TANNER LAKE DAM
RAY COUNTY, MISSOURI
MO 11230

PHOTO INDEX

PLATE B-1

PHOTO NO. 2 - LOOKING NORTHEAST ON THE CREST ON THE RIGHT END

PHOTO NO. 3 - CREST OF DAM TAKEN FROM LEFT END SHOWING UP-STREAM AND DOWNSTREAM SLOPES OF THE DAM

PHOTO NO. 4 - LOOKING SOUTHWEST ON THE CREST ON THE RIGHT END

PHOTO NO. 5 - DOWNSTREAM SLOPE ON THE RIGHT END. WHOLE DAM IS COMPLETELY COVERED WITH LOCUST TREES

PHOTO NO. 6 - LOOKING UP TOWARD CENTERLINE OF DAM FROM THE TOE A LITTLE LEFT OF THE SPILLWAY

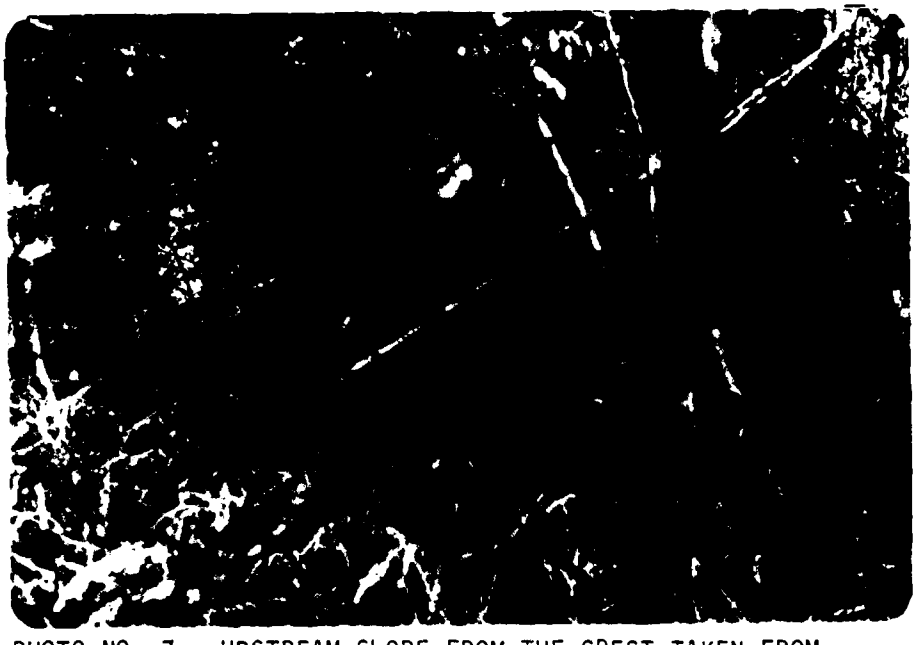


PHOTO NO. 7 - UPSTREAM SLOPE FROM THE CREST TAKEN FROM SOMEWHERE LEFT OF THE SPILLWAY

FORM 2

PHOTO NO. 8 - LOOKING UP THE UPSTREAM SLOPE TO THE CREST

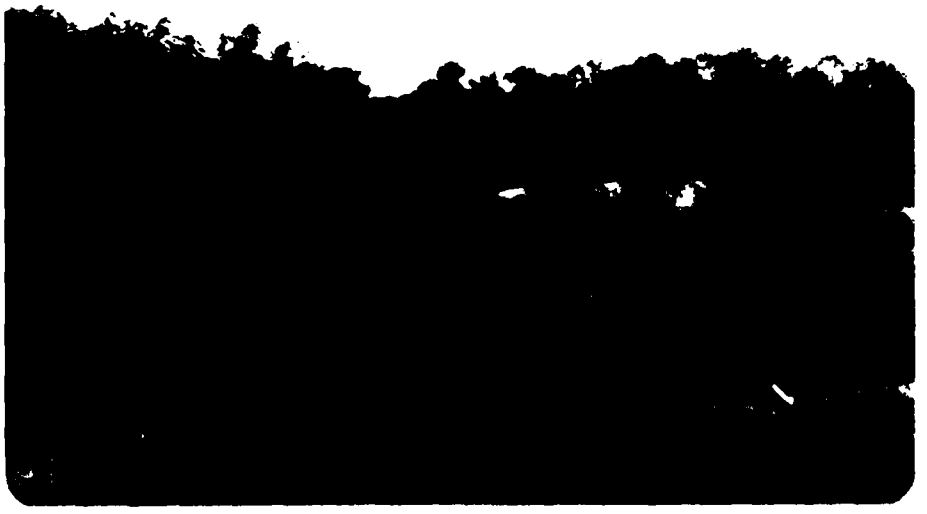


PHOTO NO. 9 - UPSTREAM SLOPE TAKEN FROM THE LEFT END

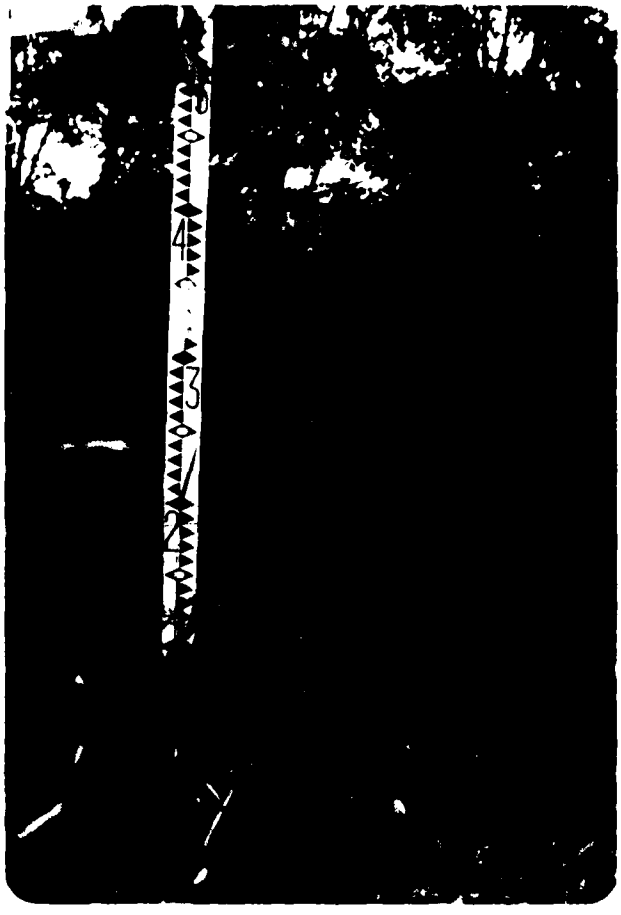


PHOTO NO. 10 - HOODED INLET TO THE PRINCIPAL SPILLWAY

PHOTO NO. 11 - OUTLET OF PRINCIPAL SPILLWAY

PHOTO NO. 12 - OUTLET OF PRINCIPAL SPILLWAY

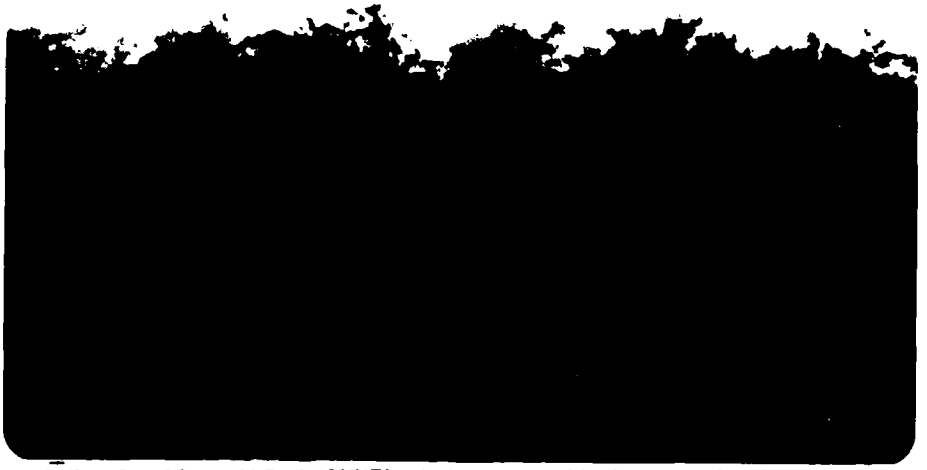


PHOTO NO. 13 - OLD CHANNEL JUST DOWNSTREAM OF DAM AND PRINCIPAL SPILLWAY OUTLET

PHOTO NO. 14 - OVERVIEW TAKEN FROM THE LEFT SIDE UPSTREAM OF THE DAM

PHOTO NO. 15 - SHOWS 4 HOUSES JUST ABOUT A MILE NORTHEAST OF CAMDEN AT THE JUNCTION OF HIGHWAY 210 & H. HOUSES ARE ABOUT 3 MILES DOWNSTREAM

FORM 2

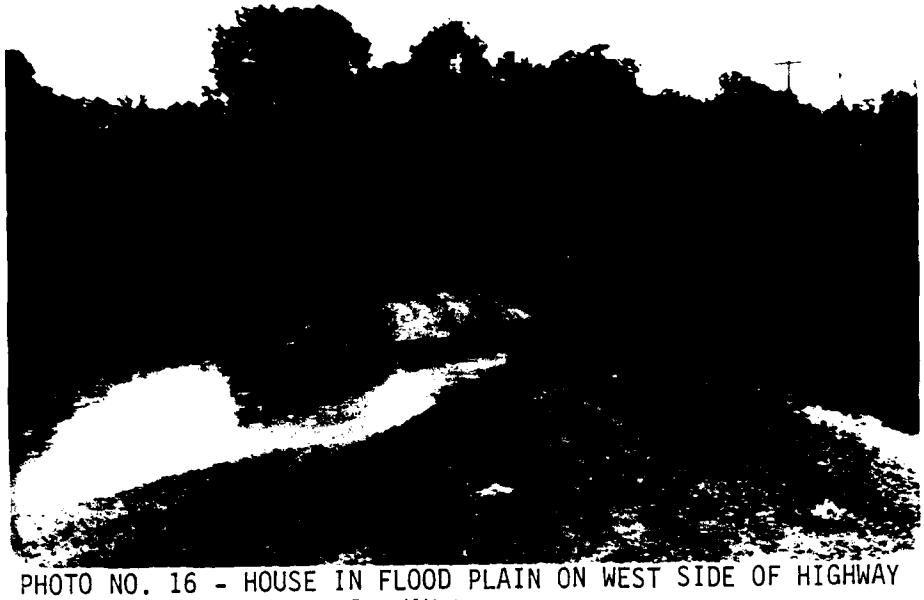


PHOTO NO. 16 - HOUSE IN FLOOD PLAIN ON WEST SIDE OF HIGHWAY 210 AT JUNCTION WITH HIGHWAY H

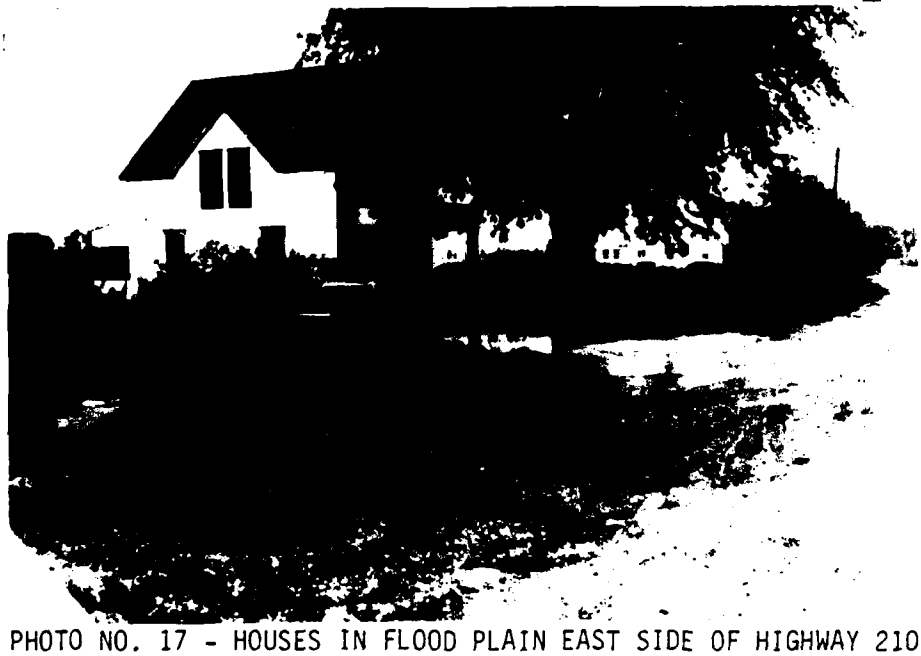
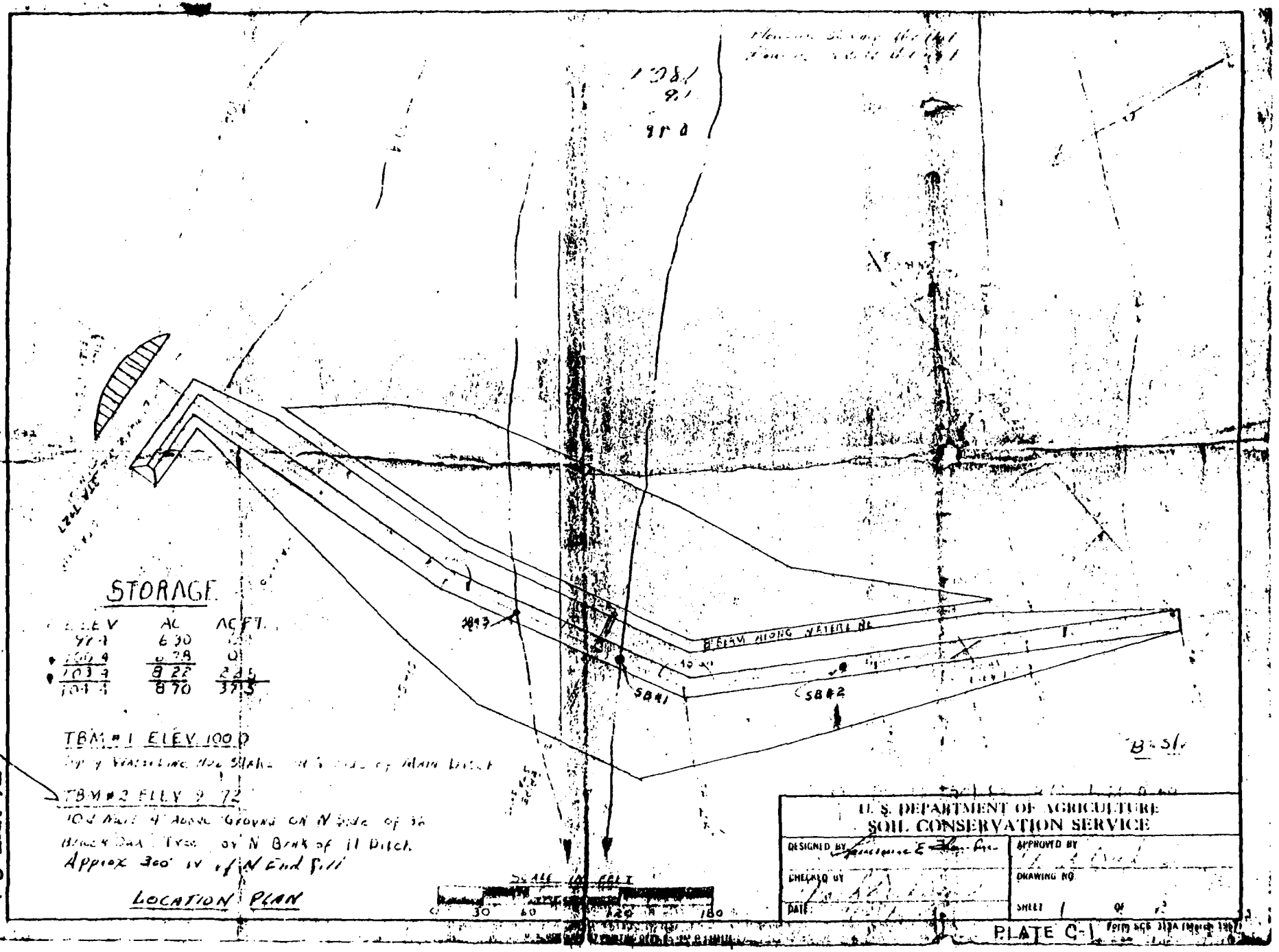
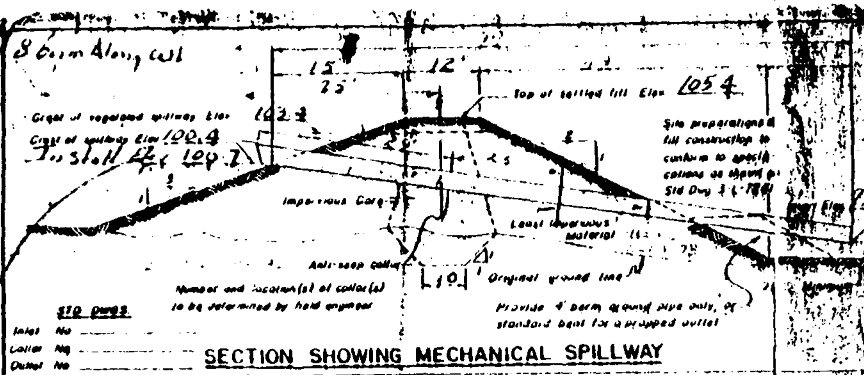


PHOTO NO. 17 - HOUSES IN FLOOD PLAIN EAST SIDE OF HIGHWAY 210

PHOTO NO. 18 - ANOTHER 2 HOUSES LOCATED AT THE JUNCTION OF 210 & H

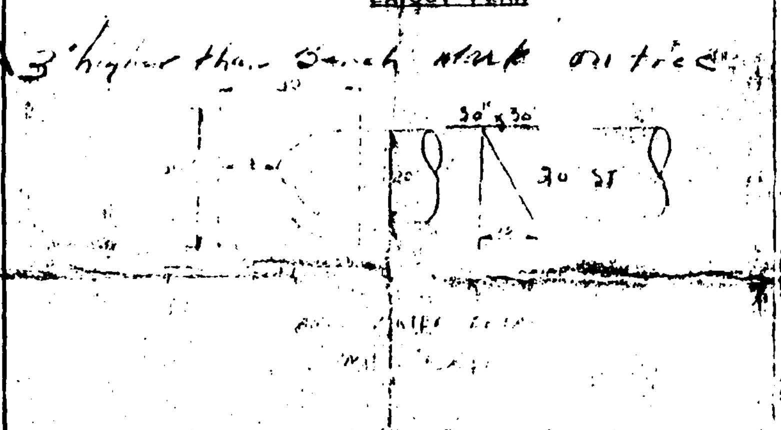
APPENDIX C
PROJECT PLATES


STORAGE
ELEV AC AC FT.
97.1 6.30 0
100.9 8.28 81
103.9 8.22 245
104.1 8.70 3313
TBM #1 ELEV 100.0
TBM #2 ELEV 9.72
Approx 300' W of N End Fill
LOCATION PLAN
SCALE 1" = 60'
30 60 120 180
SB#1
SB#2
BERM ALONG WATER'S EDGE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DESIGNED BY
CHECKED BY
DATE
APPROVED BY
DRAWING NO.
SHEET 1 OF 1
PLATE C-1
PLATE C-1

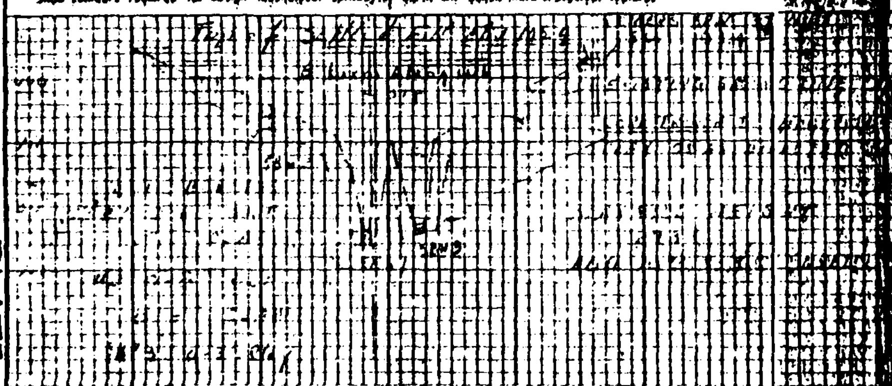


SECTION SHOWING MECHANICAL SPILLWAY

LAYOUT PLAN



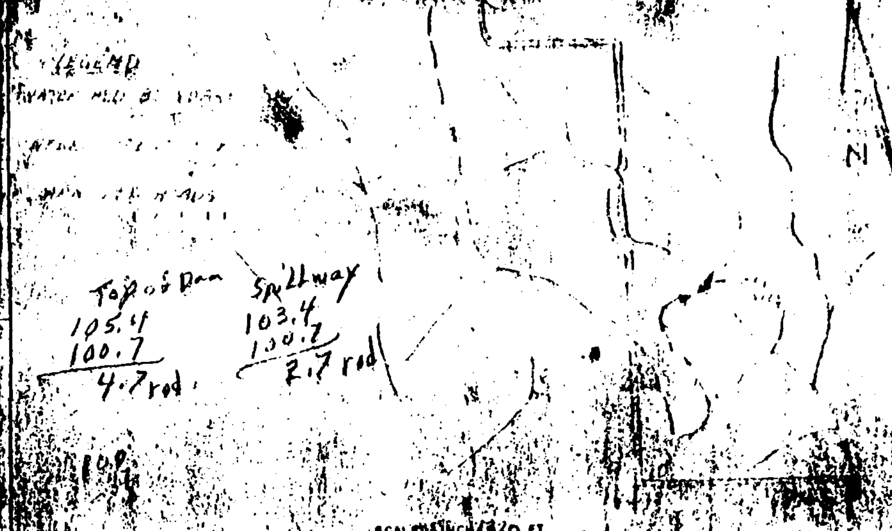
Show contours required for design- mechanical spillway(s)- earth fill- bench mark & physical features



CROSS- SECTION ALONG CENTERLINE OF FILL

(Show soil borings)

WATERSHED MAP



DESIGN DATA

DRAINAGE AREA 165 ACS

SURFACE AREA (PERM. POOL) 6.70 ACS

24 HOUR RAINFALL IN RUNOFF CURVE

DESIGN RUNOFF IN

VOL. FLOOD RUNOFF (Vr)= AC FT

PIPE FLOW

H (TO EMER. SPILLWAY) FT

MAXIMUM STAGE 20 FT

VOL. FLOOD STORAGE REQ'D 175 AC FT

HOOD INLET

STAGE-INLET INVERT TO EMERG SPILLWAY 1 FT

EMERGENCY SPILLWAY ($Q = 2.78\,LH^{3/2}$)

DESIGN Q = 50 % OF Q 62.8 C F S

WIDTH (L) = 10 FT DEPTH OF FLOW (H) = 2.0 FT

FREEBOARD REQUIRED = 2 FT

ESTIMATED QUANTITIES

QUAN	UNIT	
	CY	EARTHFILL

NOTE: Rivets in coupling bands...

COOPERATOR

COOPERATING WITH COUNTY SCD

STATE SEC

SURVEYED DATE

HOOD INLET PIPE SPILLWAY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE C-2

ORDER THIS BLANK DATA SHEET BY DRAWING NUMBER 3-N-

PLATE C-2

APPENDIX D
HYDRAULIC AND HYDROLOGIC DATA

HYDROLOGIC COMPUTATIONS

1. The SCS dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs (See this Appendix).

   a. Twenty-four hour, one percent probabilistic rainfall for the dam location was taken from the data for the rainfall station at Sweet Springs, MO. as supplied by the St. Louis District, Corps of Engineers per their letter date 4 March 1980. The twenty-four probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis policy and guidance for hydraulics and hydrology.

   b. Drainage area - 0.258 square miles (165 acres).

   c. Time of concentration of runoff = 18 minutes (computed from the "Kirpich" method and verified using the SCS "Upland" method).

   d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the one percent probabilistic precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the invert of the principal spillway.

   e. The total twenty-four hour storm duration losses for the one percent probabilistic storm were 2.91 inches. The total losses for the PMF storm were 1.58 inches. These data are based on SCS runoff curve No. 88 and No. 75 for antecedent moisture conditions SCS AMC III and AMC II respectively. The watershed is composed of SCS hydrologic soil groups B, C and D. Approximately 45 percent of the watershed consists of B soils (Knox, Sharpsburg, Kennebec and Sibley soils); 36 percent consist of C soils (Greenton soils); and 19 percent consist of D soils (Snead soils). The D soils contain primarily woods with some area in pasture. The C soils contain primarily pasture with some small grain. The B soils have both small grain and legumes being produced with contour farming being practiced.

   f. Average soil loss rates = 0.06 inch per hour approximately (for PMF storm, AMC III).

2. The combined discharge rating consisted of three components: the flow through the principal spillway, the flow through the emergency spillway, and the flow going over the top of the dam.

a. The principal spillway rating was developed using the methods described in "Hood Inlets for Culvert Spillways", Technical Release No. 3, Design Section, June 27, 1956, USDA-SCS. The rating consisted of weir flow, slug flow, and full pipe flow. Full flow controls at or above pool elevation 102.7 feet.

1) Weir flow was developed from Table No. 1 of the above referenced article.

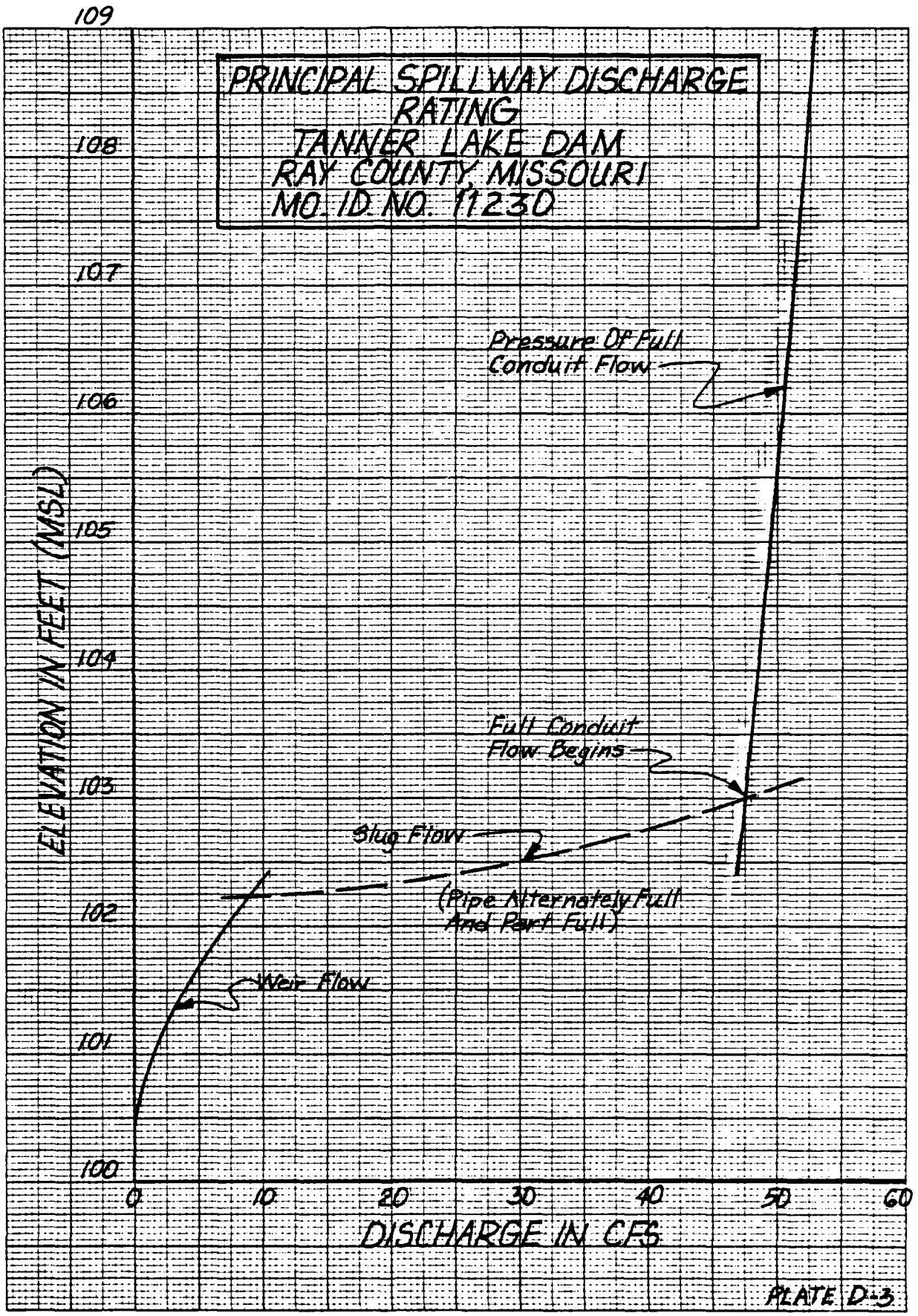
2) Full flow equation - $Q = a\sqrt{\frac{2gH}{1+Ke+Km+KpL}}$

where a = area of pipe, $ft.^2$ = 2.18
Ke = entrance loss coefficient = 0
Km = bend loss coefficient = 0
Kp = pipe-friction loss coefficient = 0.01349
L = length of pipe, ft., = 98 ft.

b. The emergency spillway rating was developed using the Corps of Engineers, Water Surface Profile HEC-2 computer program assuming critical depth downstream of the centerline of the dam.

c. The flows over the dam were determined by using the dam overtopping analyses within the HEC-1 (Dam Safety Version) program.

3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program to determine the capabilities of the spillway and dam embankment crest. The input, output and plotted hydrographs are attached in this Appendix.



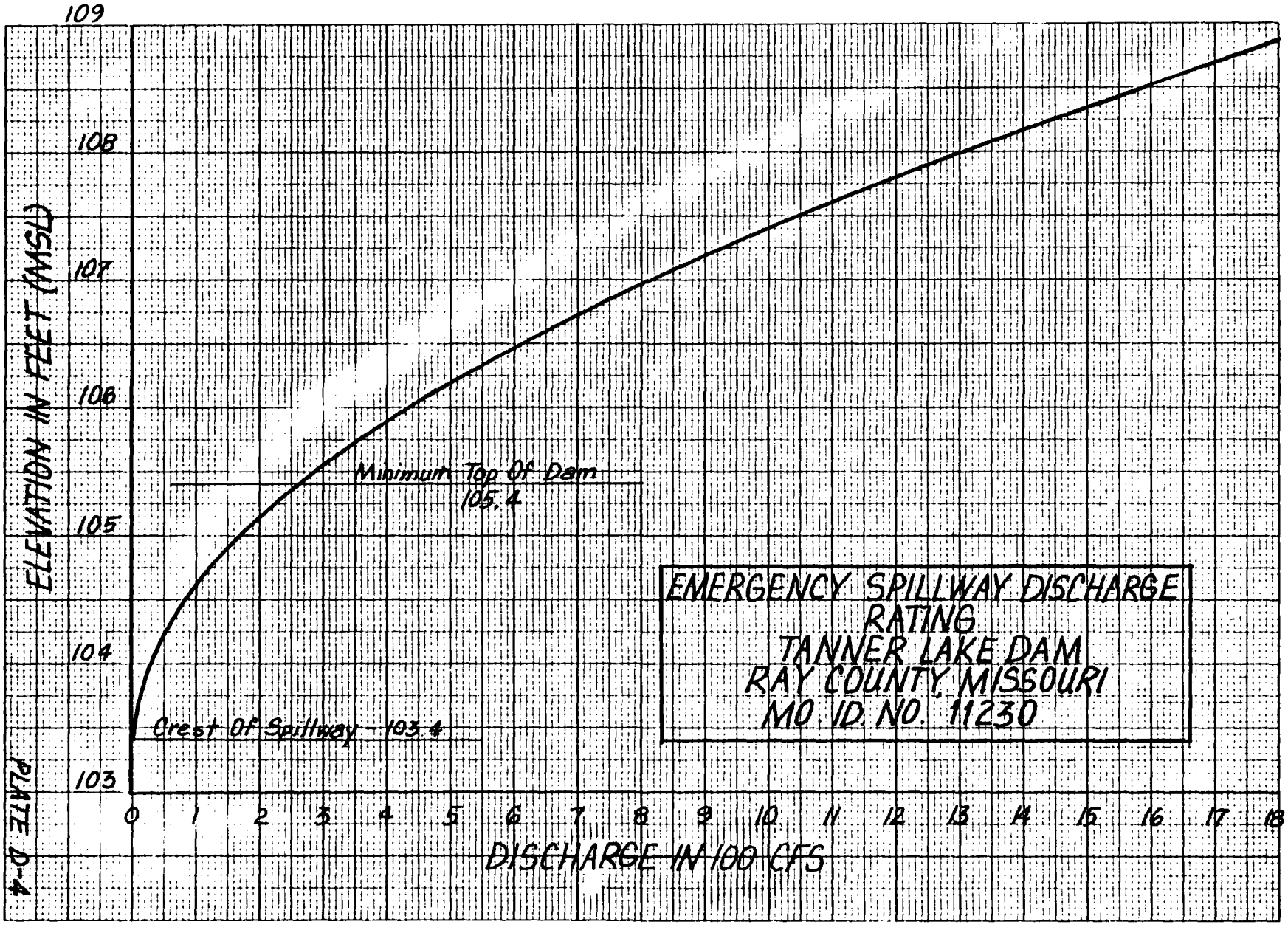


PLATE D-4

LISTING OF CARD INPUT DATA

```
A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
A2       H & H ANALYSIS OF SAFETY OF TANNER LAKE DAM 11230
A3       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR
B 0002880000000000000005                                  000000000000000000000003
B1000005
J 0000010000000900000001
J1000.1000000,2000000,2500000,3000000,3500000,4000000,4500000,50000001,0
K 000000000000001                                         000000000000000000000001
K1       CALCULATION OF INFLOW HYDROGRAPH TO RESERVOIR 11230
M 0000010000000020000,258          0000,258000001,0                        00000001
P 000000000024,5000001020000012100000130
T                                                                  -1,0    -88,0
W2          -0,18
X 000000     -,0100000001
K 00000100000002                          000000020000000000000001
K1       ROUTED FLOWS THROUGH RESERVOIR 11230
Y                              0000000100000001
Y1000001                                                  -100,4        -1
Y40100,4000102,1000103,0000103,4000104,0000105,0000105,4000106,0000107,0000108,0
Y40109,0
Y5000000000000080000004800000048000000790000022000000310000004800000087100001352
Y5001903
$A000000000002,9000006,3000006,8000008,2000008,7000013,8
$E0076,1000089,2000099,4000100,4000103,4000104,4000109,2
$$0100,4
$D0105,4000002,3000001,500000700
K 000099
A
A
A
A
A
```

PLATE D-5

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 80/08/14.
     TIME= 15.03.18.
```

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
H & H ANALYSIS OF SAFETY OF TANNER LAKE DAM 11230
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	0	0	0	0	0	3	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS=	.10	.20	.25	.30	.35	.40	.45	.50	1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLOW HYDROGRAPH TO RESERVOIR 11230

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000001	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.26	0.00	.26	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.50	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRIL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-88.00	0.00	0.00

CURVE NO = -88.00 WETNESS = -1.00 EFFECT CN = 88.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 0.00

RECESSION DATA
STRTQ= 0.00 QRCSN= -.01 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 0.00 VOL= 1.00

1484.	415.	82.	16.	0.

PLATE D-6

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.05	145	.21	.20	.01	328.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.10	146	.21	.20	.01	386.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.15	147	.21	.20	.01	398.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.20	148	.21	.20	.01	401.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.25	149	.21	.20	.01	402.
1.01	.30	6	.01	0.00	.01	0.	1.01	12.30	150	.21	.20	.01	403.
1.01	.35	7	.01	0.00	.01	0.	1.01	12.35	151	.21	.20	.01	404.
1.01	.40	8	.01	0.00	.01	0.	1.01	12.40	152	.21	.20	.01	404.
1.01	.45	9	.01	0.00	.01	0.	1.01	12.45	153	.21	.20	.01	405.
1.01	.50	10	.01	0.00	.01	0.	1.01	12.50	154	.21	.20	.01	405.
1.01	.55	11	.01	0.00	.01	0.	1.01	12.55	155	.21	.20	.00	406.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.00	156	.21	.20	.00	406.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.05	157	.25	.24	.01	467.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.10	158	.25	.24	.01	485.
1.01	1.15	15	.01	0.00	.01	0.	1.01	13.15	159	.25	.25	.00	488.
1.01	1.20	16	.01	0.00	.01	0.	1.01	13.20	160	.25	.25	.00	490.
1.01	1.25	17	.01	0.00	.01	0.	1.01	13.25	161	.25	.25	.00	490.
1.01	1.30	18	.01	0.00	.01	0.	1.01	13.30	162	.25	.25	.00	490.
1.01	1.35	19	.01	0.00	.01	0.	1.01	13.35	163	.25	.25	.00	491.
1.01	1.40	20	.01	0.00	.01	0.	1.01	13.40	164	.25	.25	.00	491.
1.01	1.45	21	.01	0.00	.01	0.	1.01	13.45	165	.25	.25	.00	492.
1.01	1.50	22	.01	0.00	.01	0.	1.01	13.50	166	.25	.25	.00	492.
1.01	1.55	23	.01	.00	.01	0.	1.01	13.55	167	.25	.25	.00	492.
1.01	2.00	24	.01	.00	.01	0.	1.01	14.00	168	.25	.25	.00	492.
1.01	2.05	25	.01	.00	.01	1.	1.01	14.05	169	.31	.31	.00	584.
1.01	2.10	26	.01	.00	.01	1.	1.01	14.10	170	.31	.31	.00	610.
1.01	2.15	27	.01	.00	.01	2.	1.01	14.15	171	.31	.31	.00	616.
1.01	2.20	28	.01	.00	.01	2.	1.01	14.20	172	.31	.31	.00	617.
1.01	2.25	29	.01	.00	.01	2.	1.01	14.25	173	.31	.31	.00	617.
1.01	2.30	30	.01	.00	.01	3.	1.01	14.30	174	.31	.31	.00	618.
1.01	2.35	31	.01	.00	.01	3.	1.01	14.35	175	.31	.31	.00	618.
1.01	2.40	32	.01	.00	.01	3.	1.01	14.40	176	.31	.31	.00	618.
1.01	2.45	33	.01	.00	.01	4.	1.01	14.45	177	.31	.31	.00	618.
1.01	2.50	34	.01	.00	.01	4.	1.01	14.50	178	.31	.31	.00	619.
1.01	2.55	35	.01	.00	.01	5.	1.01	14.55	179	.31	.31	.00	619.
1.01	3.00	36	.01	.00	.01	5.	1.01	15.00	180	.31	.31	.00	619.
1.01	3.05	37	.01	.00	.01	5.	1.01	15.05	181	.19	.19	.00	439.
1.01	3.10	38	.01	.00	.01	5.	1.01	15.10	182	.38	.38	.00	668.
1.01	3.15	39	.01	.00	.01	6.	1.01	15.15	183	.38	.38	.00	737.
1.01	3.20	40	.01	.00	.01	6.	1.01	15.20	184	.57	.57	.00	1031.
1.01	3.25	41	.01	.00	.01	6.	1.01	15.25	185	.66	.66	.00	1252.
1.01	3.30	42	.01	.00	.01	7.	1.01	15.30	186	1.61	1.61	.01	2709.
1.01	3.35	43	.01	.00	.01	7.	1.01	15.35	187	2.66	2.65	.01	4658.
1.01	3.40	44	.01	.00	.01	7.	1.01	15.40	188	1.04	1.04	.00	2786.
1.01	3.45	45	.01	.00	.01	7.	1.01	15.45	189	.66	.66	.00	1658.
1.01	3.50	46	.01	.00	.01	8.	1.01	15.50	190	.57	.57	.00	1246.
1.01	3.55	47	.01	.00	.01	8.	1.01	15.55	191	.38	.38	.00	869.
1.01	4.00	48	.01	.00	.01	8.	1.01	16.00	192	.38	.38	.00	776.
1.01	4.05	49	.01	.00	.01	8.	1.01	16.05	193	.29	.29	.00	629.
1.01	4.10	50	.01	.00	.01	9.	1.01	16.10	194	.29	.29	.00	589.
1.01	4.15	51	.01	.00	.01	9.	1.01	16.15	195	.29	.29	.00	582.
1.01	4.20	52	.01	.00	.01	9.	1.01	16.20	196	.29	.29	.00	581.
1.01	4.25	53	.01	.00	.01	9.	1.01	16.25	197	.29	.29	.00	581.
1.01	4.30	54	.01	.00	.01	9.	1.01	16.30	198	.29	.29	.00	581.
1.01	4.35	55	.01	.00	.01	10.	1.01	16.35	199	.29	.29	.00	581.
1.01	4.40	56	.01	.00	.01	10.	1.01	16.40	200	.29	.29	.00	581.
1.01	4.45	57	.01	.01	.01	10.	1.01	16.45	201	.29	.29	.00	581.
1.01	4.50	58	.01	.01	.01	10.	1.01	16.50	202	.29	.29	.00	581.
1.01	4.55	59	.01	.01	.01	10.	1.01	16.55	203	.29	.29	.00	581.

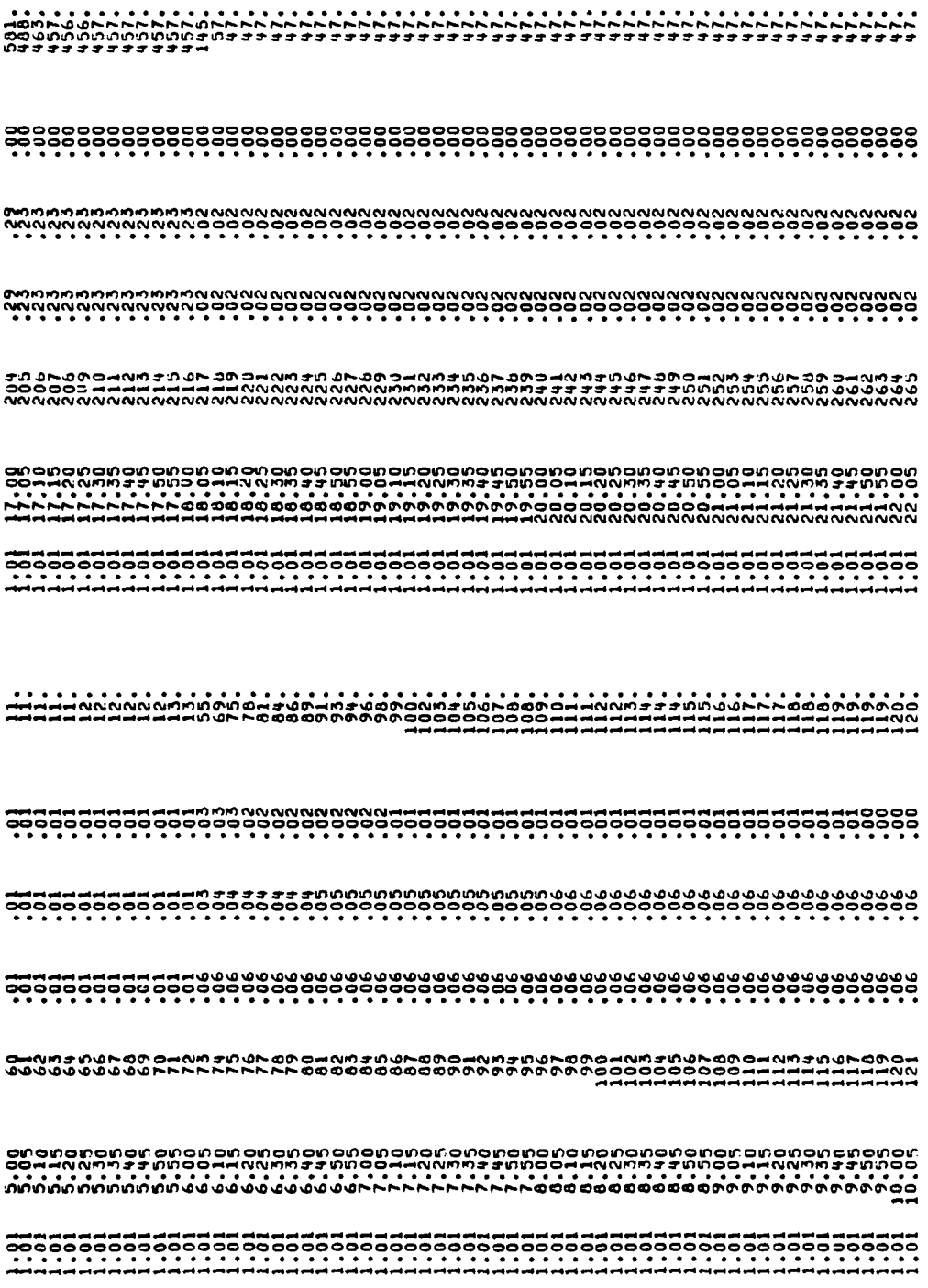


PLATE D-8

1:01	10.10	122	.06	.06	.00	120.	1.01	22.10	266	.02	.02	.00	47.
1.01	10.15	123	.06	.06	.00	120.	1.01	22.15	267	.02	.02	.00	47.
1.01	10.20	124	.06	.06	.00	121.	1.01	22.20	268	.02	.02	.00	47.
1.01	10.25	125	.06	.06	.00	121.	1.01	22.25	269	.02	.02	.00	47.
1.01	10.30	126	.06	.06	.00	121.	1.01	22.30	270	.02	.02	.00	47.
1.01	10.35	127	.06	.06	.00	121.	1.01	22.35	271	.02	.02	.00	47.
1.01	10.40	128	.06	.06	.00	121.	1.01	22.40	272	.02	.02	.00	47.
1.01	10.45	129	.06	.06	.00	121.	1.01	22.45	273	.02	.02	.00	47.
1.01	10.50	130	.06	.06	.00	122.	1.01	22.50	274	.02	.02	.00	47.
1.01	10.55	131	.06	.06	.00	122.	1.01	22.55	275	.02	.02	.00	47.
1.01	11.00	132	.06	.06	.00	122.	1.01	23.00	276	.02	.02	.00	47.
1.01	11.05	133	.06	.06	.00	122.	1.01	23.05	277	.02	.02	.00	47.
1.01	11.10	134	.06	.06	.00	122.	1.01	23.10	278	.02	.02	.00	47.
1.01	11.15	135	.06	.06	.00	122.	1.01	23.15	279	.02	.02	.00	47.
1.01	11.20	136	.06	.06	.00	123.	1.01	23.20	280	.02	.02	.00	47.
1.01	11.25	137	.06	.06	.00	123.	1.01	23.25	281	.02	.02	.00	47.
1.01	11.30	138	.06	.06	.00	123.	1.01	23.30	282	.02	.02	.00	47.
1.01	11.35	139	.06	.06	.00	123.	1.01	23.35	283	.02	.02	.00	47.
1.01	11.40	140	.06	.06	.00	123.	1.01	23.40	284	.02	.02	.00	47.
1.01	11.45	141	.06	.06	.00	123.	1.01	23.45	285	.02	.02	.00	47.
1.01	11.50	142	.06	.06	.00	123.	1.01	23.50	286	.02	.02	.00	47.
1.01	11.55	143	.06	.06	.00	123.	1.01	23.55	287	.02	.02	.00	47.
1.01	12.00	144	.06	.06	.00	124.	1.02	0.00	288	.02	.02	.00	47.
									SUM	31.85	30.27	1.58	61161.
										(809.)	(769.)	(40.)	(1731.89)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4658.	684.	212.	212.	61106.
CMS	132.	19.	6.	6.	1730.
INCHES		24.67	30.60	30.60	30.60
MM		626.62	777.24	777.24	777.24
AC-FT		339.	421.	421.	421.
THOUS CU M		418.	519.	519.	519.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	466.	68.	21.	21.	6111.
CMS	13.	2.	1.	1.	173.
INCHES		2.47	3.06	3.06	3.06
MM		62.66	77.72	77.72	77.72
AC-FT		34.	42.	42.	42.
THOUS CU M		42.	52.	52.	52.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	932.	137.	42.	42.	12221.
CMS	26.	4.	1.	1.	346.
INCHES		4.93	6.12	6.12	6.12
MM		125.32	155.45	155.45	155.45
AC-FT		68.	84.	84.	84.
THOUS CU M		84.	104.	104.	104.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 3

CFS	2329.	342.	106.	106.	30553.
CMS	66.	10.	3.	3.	865.
INCHES		12.33	15.30	15.30	15.30
MM		313.31	388.62	388.62	388.62
AC-FT		170.	210.	210.	210.
THOUS CU M		209.	260.	260.	260.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 9

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4658.	684.	212.	212.	61106.
CMS	132.	19.	6.	6.	1730.
INCHES		24.67	30.60	30.60	30.60
MM		626.62	777.24	777.24	777.24
AC-FT		339.	421.	421.	421.
THOUS CU M		418.	519.	519.	519.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH RESERVOIR 11230

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000002	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-100.	-1

STAGE	100.40	102.10	103.00	103.40	104.00	105.00	105.40	106.00	107.00	108.00
	109.00									
FLOW	0.00	8.00	48.00	48.00	79.00	220.00	310.00	480.00	871.00	1352.00
	1903.00									

SURFACE AREA=	0.	3.	6.	7.	8.	9.	14.
CAPACITY=	0.	13.	58.	65.	87.	96.	149.
ELEVATION=	76.	89.	99.	100.	103.	104.	109.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
100.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
105.4	2.3	1.5	700.

STATION 000002, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

PLATE D-10

OVN

STATION 000002, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	7.	7.	7.	7.	8.	9.
12.	14.	17.	20.	22.	24.	27.	29.	32.	34.
37.	39.	41.	44.	46.	48.	48.	48.	48.	48.
48.	48.	48.	50.	53.	56.	59.	62.	64.	67.
68.	70.	73.	77.	91.	123.	187.	256.	284.	285.
274.	257.	240.	221.	211.	201.	192.	185.	178.	171.
166.	161.	156.	152.	147.	142.	137.	132.	128.	124.
120.	117.	114.	112.	110.	108.	103.	94.	85.	78.
75.	73.	70.	68.	65.	63.	61.	58.	56.	54.
52.	51.	49.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	46.	45.	43.	42.
41.	40.	39.	37.	36.	35.	34.	33.	32.	32.
31.	30.	29.	28.	28.	27.	26.	26.	25.	24.
24.	23.	23.	22.	22.	21.	21.	20.	20.	19.
19.	19.	18.	18.	18.	17.	17.	17.		

STORAGE

65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	67.	67.	67.	67.	67.	67.	67.	68.
68.	68.	68.	68.	68.	68.	68.	69.	69.	69.
69.	69.	69.	69.	70.	70.	70.	70.	70.	70.
70.	70.	71.	71.	71.	71.	71.	71.	71.	72.
72.	72.	72.	72.	72.	72.	72.	73.	73.	73.
73.	73.	73.	73.	74.	74.	74.	74.	74.	74.
74.	74.	75.	75.	75.	75.	76.	76.	77.	77.
78.	78.	79.	79.	80.	80.	80.	81.	81.	82.
82.	83.	83.	83.	84.	84.	85.	85.	85.	86.
86.	87.	87.	88.	88.	89.	89.	90.	90.	91.
91.	91.	92.	92.	93.	95.	99.	103.	104.	104.
104.	103.	102.	101.	101.	100.	100.	99.	99.	98.
98.	98.	97.	97.	97.	96.	96.	96.	95.	95.
95.	95.	95.	95.	94.	94.	94.	93.	93.	92.
92.	91.	91.	91.	90.	90.	89.	89.	89.	89.
88.	88.	88.	87.	87.	87.	87.	86.	86.	86.

PLATE D-11

86.	85.	85.	85.	84.	84.	84.	84.	83.	83.
83.	83.	83.	82.	82.	82.	82.	82.	81.	81.
81.	81.	81.	81.	81.	81.	80.	80.	80.	80.
80.	80.	80.	80.	80.	80.	79.	79.	79.	79.
79.	79.	79.	79.	79.	79.	79.	79.		

STAGE

100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.5	100.5	100.5	100.5	100.5	100.5	100.5
100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.6	100.6
100.6	100.6	100.6	100.6	100.7	100.7	100.7	100.7	100.7	100.8
100.8	100.8	100.8	100.8	100.9	100.9	100.9	100.9	100.9	101.0
101.0	101.0	101.0	101.0	101.0	101.1	101.1	101.1	101.1	101.1
101.2	101.2	101.2	101.2	101.2	101.3	101.3	101.3	101.3	101.3
101.4	101.4	101.4	101.4	101.4	101.4	101.5	101.5	101.5	101.5
101.5	101.6	101.6	101.6	101.6	101.6	101.6	101.7	101.7	101.7
101.7	101.7	101.7	101.8	101.8	101.9	101.9	102.0	102.1	102.1
102.2	102.2	102.3	102.4	102.4	102.5	102.5	102.6	102.6	102.7
102.7	102.8	102.9	102.9	102.9	103.0	103.0	103.1	103.1	103.2
103.3	103.3	103.4	103.4	103.5	103.6	103.6	103.7	103.7	103.8
103.8	103.8	103.9	104.0	104.1	104.3	104.8	105.2	105.3	105.3
105.2	105.2	105.1	105.0	104.9	104.9	104.8	104.7	104.7	104.7
104.6	104.6	104.5	104.5	104.5	104.4	104.4	104.4	104.3	104.3
104.3	104.3	104.3	104.2	104.2	104.2	104.2	104.1	104.0	104.0
103.9	103.9	103.8	103.8	103.7	103.7	103.6	103.6	103.6	103.5
103.5	103.5	103.4	103.4	103.4	103.3	103.3	103.3	103.2	103.2
103.2	103.1	103.1	103.1	103.0	103.0	103.0	102.9	102.9	102.9
102.8	102.8	102.8	102.8	102.7	102.7	102.7	102.7	102.7	102.6
102.6	102.6	102.6	102.6	102.5	102.5	102.5	102.5	102.5	102.5
102.5	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4
102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3		

PEAK OUTFLOW IS 285. AT TIME 15.83 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	285.	110.	36.	36.	10234.
CMS	8.	3.	1.	1.	290.
INCHES		3.96	5.12	5.12	5.12
MM		100.65	130.17	130.17	130.17
AC-FT		54.	70.	70.	70.
THOUS CU M		67.	87.	87.	87.

OVF

SIATION000002

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

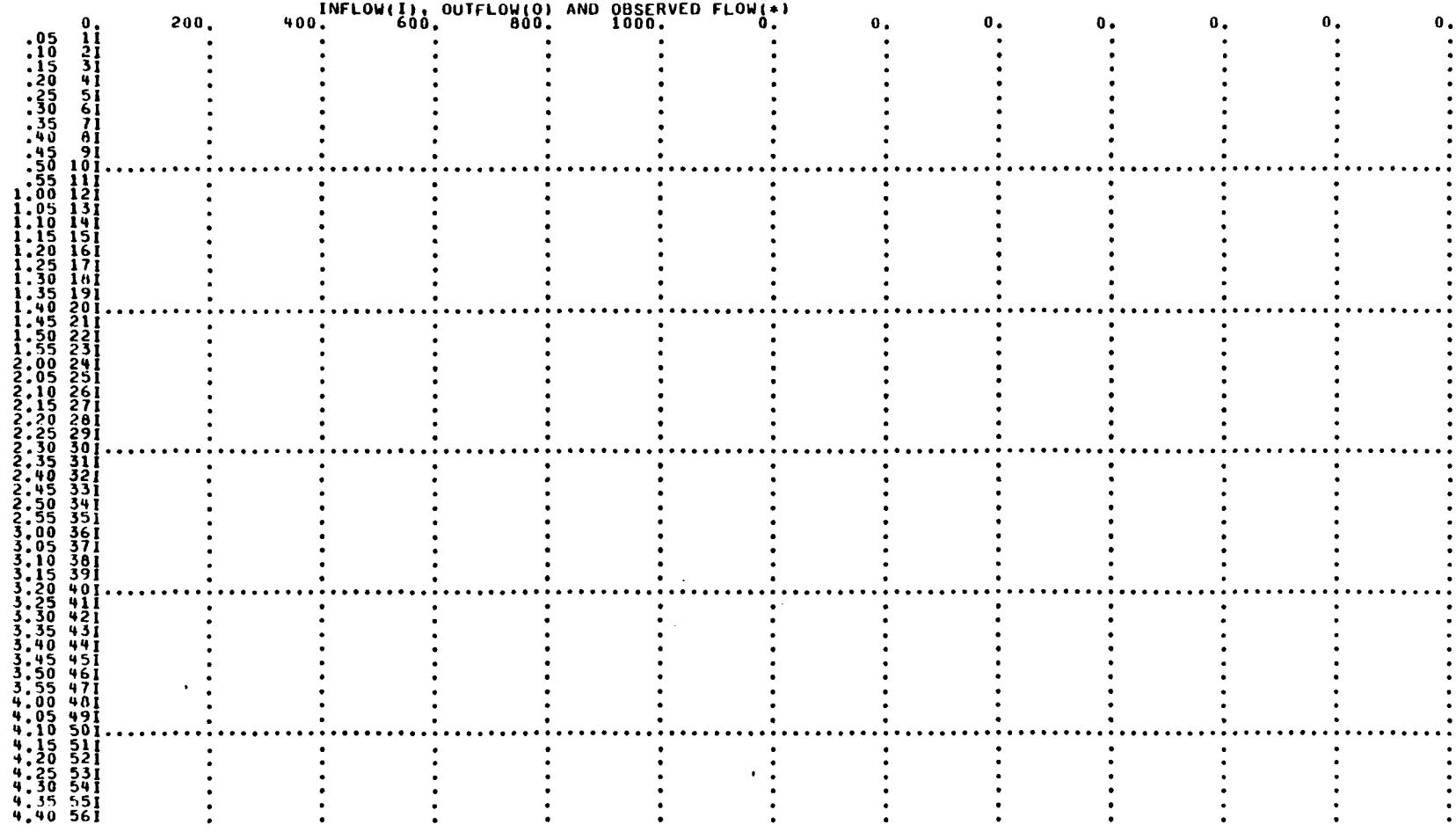


PLATE D-13

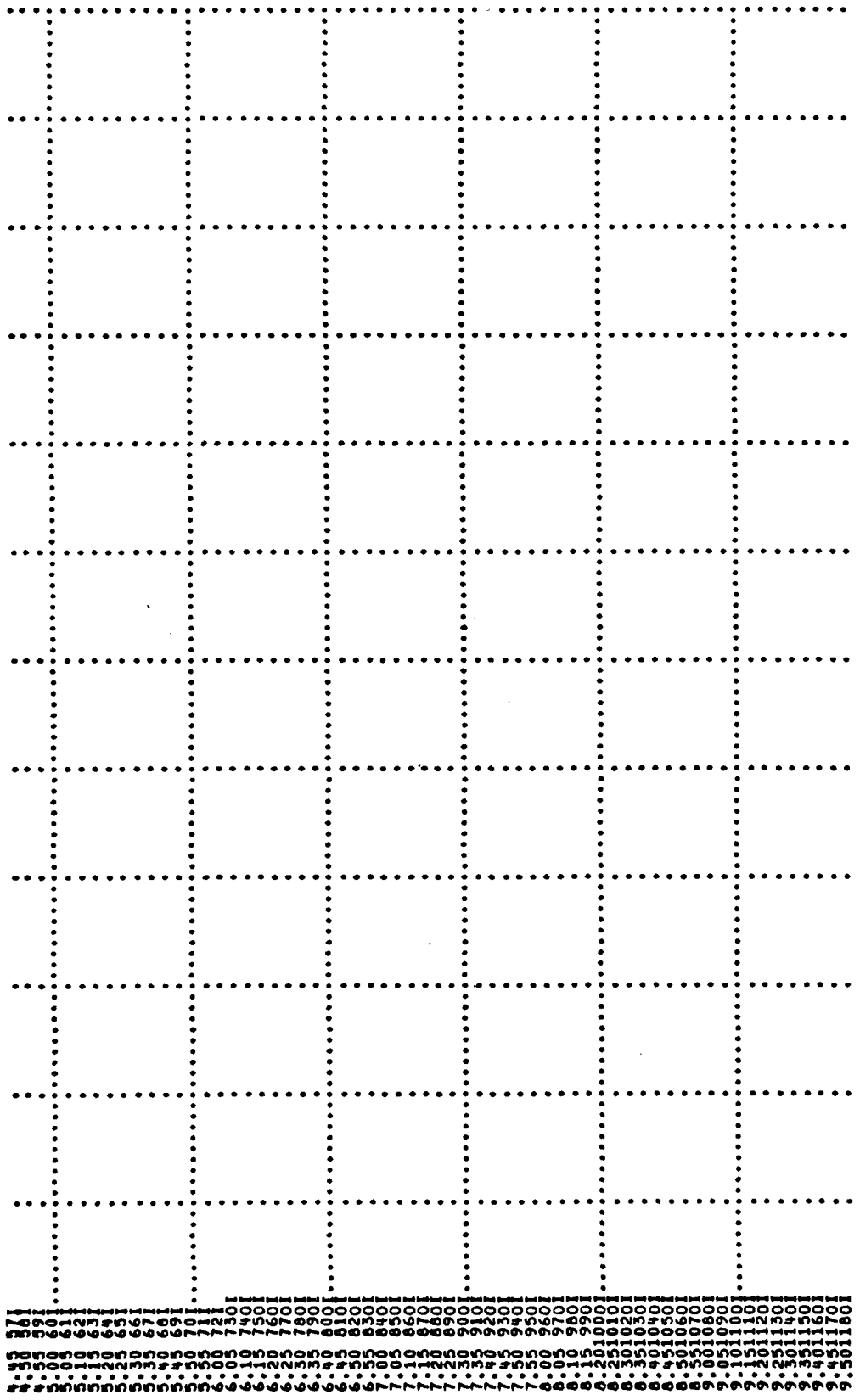


PLATE D-14

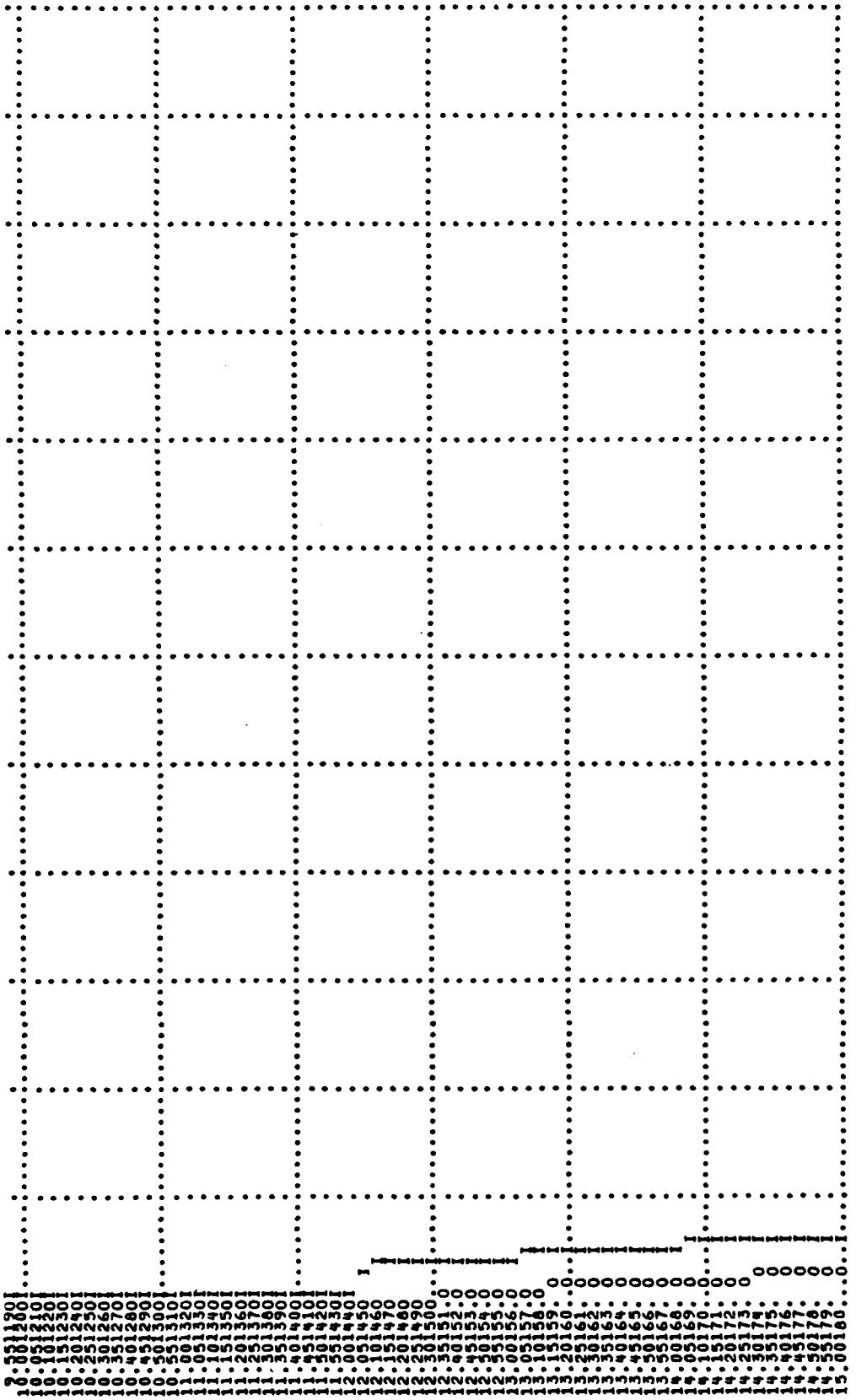


PLATE D-15

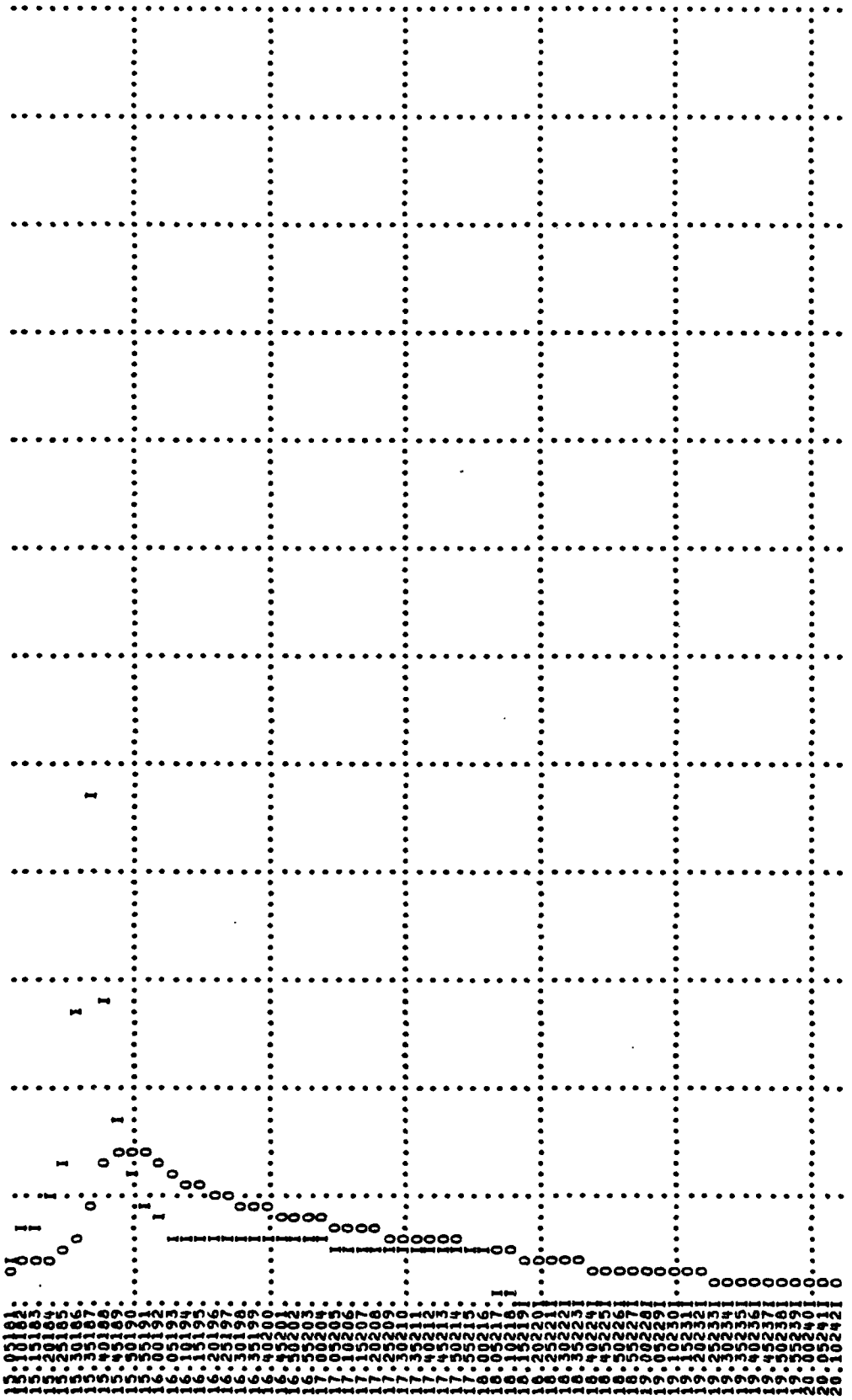


PLATE D-17

OVN

STATION 000002, PLAN 1, RATIO 8 [0.5 PMF]

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	3.	3.	3.	3.	4.	4.	4.	4.
4.	5.	5.	5.	5.	5.	6.	6.	6.	6.
7.	7.	7.	7.	7.	8.	8.	9.	10.	12.
14.	16.	18.	19.	21.	22.	24.	25.	26.	28.
29.	30.	31.	32.	33.	34.	35.	36.	37.	38.
39.	40.	41.	41.	42.	43.	44.	44.	45.	46.
46.	47.	47.	48.	48.	48.	48.	49.	55.	61.
67.	73.	78.	90.	102.	113.	124.	136.	147.	158.
167.	175.	182.	188.	194.	199.	204.	208.	214.	224.
237.	248.	257.	265.	272.	277.	281.	285.	288.	291.
288.	286.	296.	327.	455.	828.	1687.	1847.	1191.	819.
607.	478.	403.	352.	326.	315.	309.	307.	305.	303.
301.	300.	299.	298.	294.	285.	277.	270.	263.	258.
254.	250.	247.	245.	242.	240.	227.	207.	188.	171.
156.	142.	130.	118.	108.	99.	91.	84.	78.	76.
74.	72.	70.	68.	66.	64.	63.	61.	59.	58.
56.	55.	54.	52.	51.	50.	49.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	48.	48.	48.
48.	48.	48.	48.	48.	48.	48.	47.	46.	45.
44.	44.	43.	42.	41.	41.	40.	39.	39.	38.
38.	37.	37.	36.	36.	35.	35.	34.		

STORAGE

65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	67.	67.	67.	68.	68.	68.
68.	69.	69.	69.	70.	70.	70.	71.	71.	71.
72.	72.	72.	73.	73.	73.	74.	74.	74.	75.
75.	75.	76.	76.	76.	77.	77.	77.	78.	78.
78.	79.	79.	79.	79.	80.	80.	80.	80.	81.
81.	81.	81.	81.	82.	82.	82.	82.	82.	83.
83.	83.	83.	83.	83.	83.	83.	84.	84.	84.
84.	84.	84.	84.	85.	86.	87.	88.	89.	90.
91.	91.	92.	93.	94.	95.	95.	96.	97.	97.
98.	98.	99.	99.	100.	100.	100.	101.	101.	102.
102.	102.	103.	103.	103.	104.	104.	104.	104.	104.
104.	104.	105.	105.	107.	109.	113.	114.	111.	109.
108.	107.	106.	106.	105.	105.	105.	105.	105.	105.
105.	105.	105.	105.	104.	104.	104.	103.	103.	103.
103.	103.	102.	102.	102.	102.	102.	100.	99.	98.
97.	96.	96.	95.	94.	94.	93.	93.	92.	92.
92.	91.	91.	91.	90.	90.	90.	90.	89.	89.

PLATE D-18

89.	89.	88.	88.	88.	88.	88.	87.	87.	87.
87.	87.	87.	86.	86.	86.	86.	86.	86.	85.
85.	85.	85.	85.	85.	84.	84.	84.	84.	84.
84.	83.	83.	83.	83.	83.	83.	83.	83.	82.
82.	82.	82.	82.	82.	82.	82.	82.		

STAGE

100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.5	100.5	100.5	100.5
100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5
100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.6	100.6
100.6	100.6	100.6	100.6	100.7	100.7	100.7	100.8	100.8	100.8
100.9	100.9	101.0	101.0	101.1	101.1	101.2	101.2	101.2	101.3
101.3	101.4	101.4	101.5	101.5	101.6	101.6	101.7	101.7	101.7
101.8	101.8	101.9	101.9	102.0	102.0	102.1	102.1	102.2	102.2
102.2	102.3	102.3	102.4	102.4	102.4	102.5	102.5	102.5	102.5
102.6	102.6	102.6	102.6	102.7	102.7	102.7	102.7	102.8	102.8
102.8	102.8	102.8	102.9	102.9	102.9	102.9	102.9	102.9	102.9
103.0	103.0	103.0	103.0	103.1	103.2	103.3	103.4	103.5	103.7
103.8	103.9	104.0	104.1	104.2	104.2	104.3	104.4	104.5	104.6
104.6	104.7	104.7	104.8	104.8	104.9	104.9	104.9	105.0	105.0
105.1	105.1	105.2	105.2	105.2	105.3	105.3	105.3	105.3	105.3
105.3	105.3	105.3	105.4	105.6	105.8	106.2	106.3	106.0	105.8
105.7	105.6	105.5	105.5	105.4	105.4	105.4	105.4	105.4	105.4
105.4	105.4	105.3	105.3	105.3	105.3	105.3	105.2	105.2	105.2
105.2	105.1	105.1	105.1	105.1	105.1	105.0	104.9	104.8	104.7
104.5	104.4	104.4	104.3	104.2	104.1	104.1	104.0	104.0	103.9
103.9	103.9	103.8	103.8	103.7	103.7	103.7	103.7	103.6	103.6
103.6	103.5	103.5	103.5	103.5	103.4	103.4	103.4	103.4	103.4
103.3	103.3	103.3	103.3	103.3	103.2	103.2	103.2	103.2	103.1
103.1	103.1	103.1	103.1	103.0	103.0	103.0	103.0	103.0	102.9
102.9	102.9	102.9	102.9	102.9	102.8	102.8	102.8	102.8	102.8
102.8	102.8	102.7	102.7	102.7	102.7	102.7	102.7		

PEAK OUTFLOW IS 1847. AT TIME 15.67 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1847.	320.	98.	98.	28144.
CMS	52.	9.	3.	3.	797.
INCHES		11.53	14.09	14.09	14.09
MM		292.97	357.98	357.98	357.98
AC-FT		159.	194.	194.	194.
THOUS CU M		196.	239.	239.	239.

OVF

STATION000002

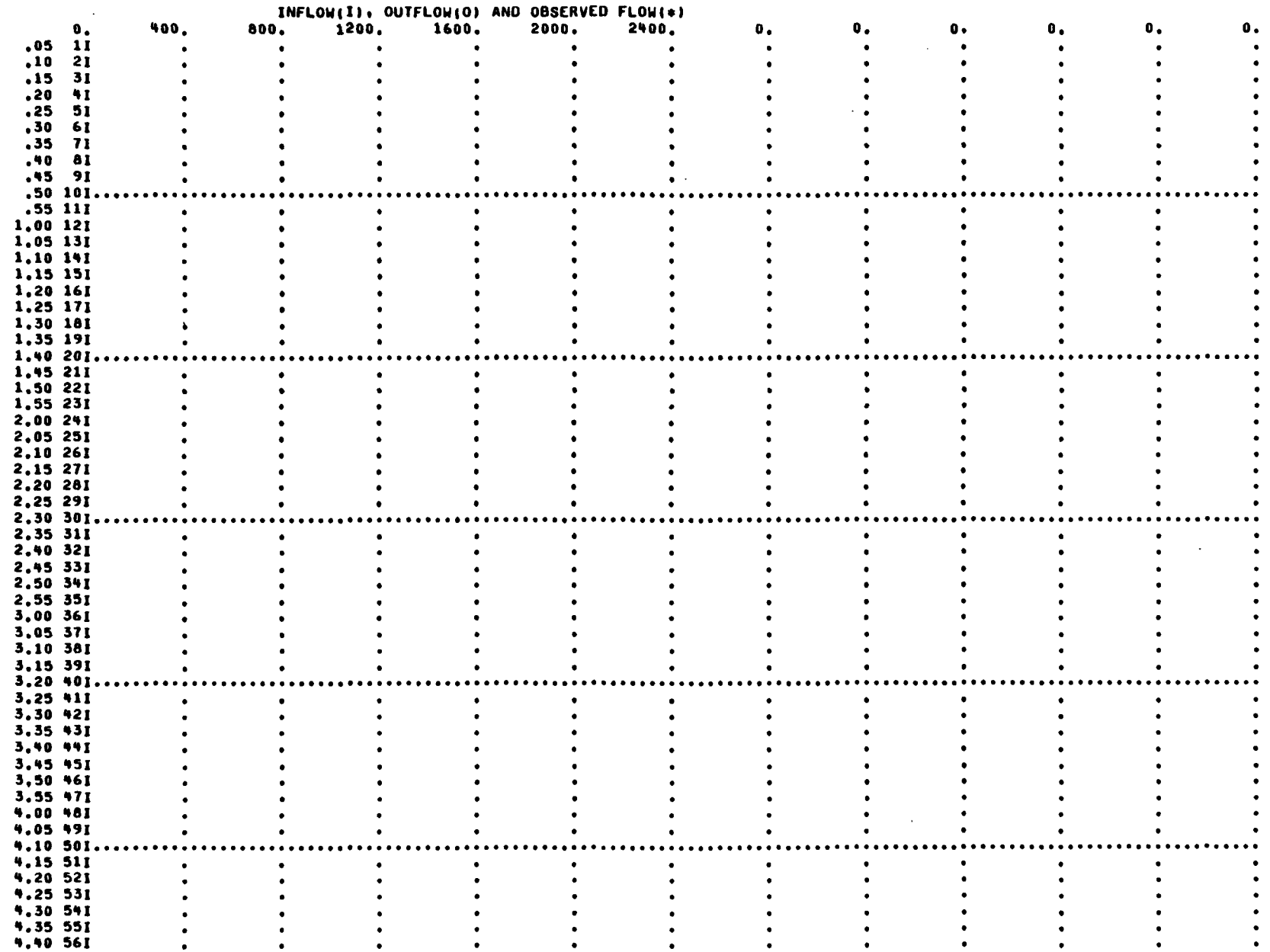
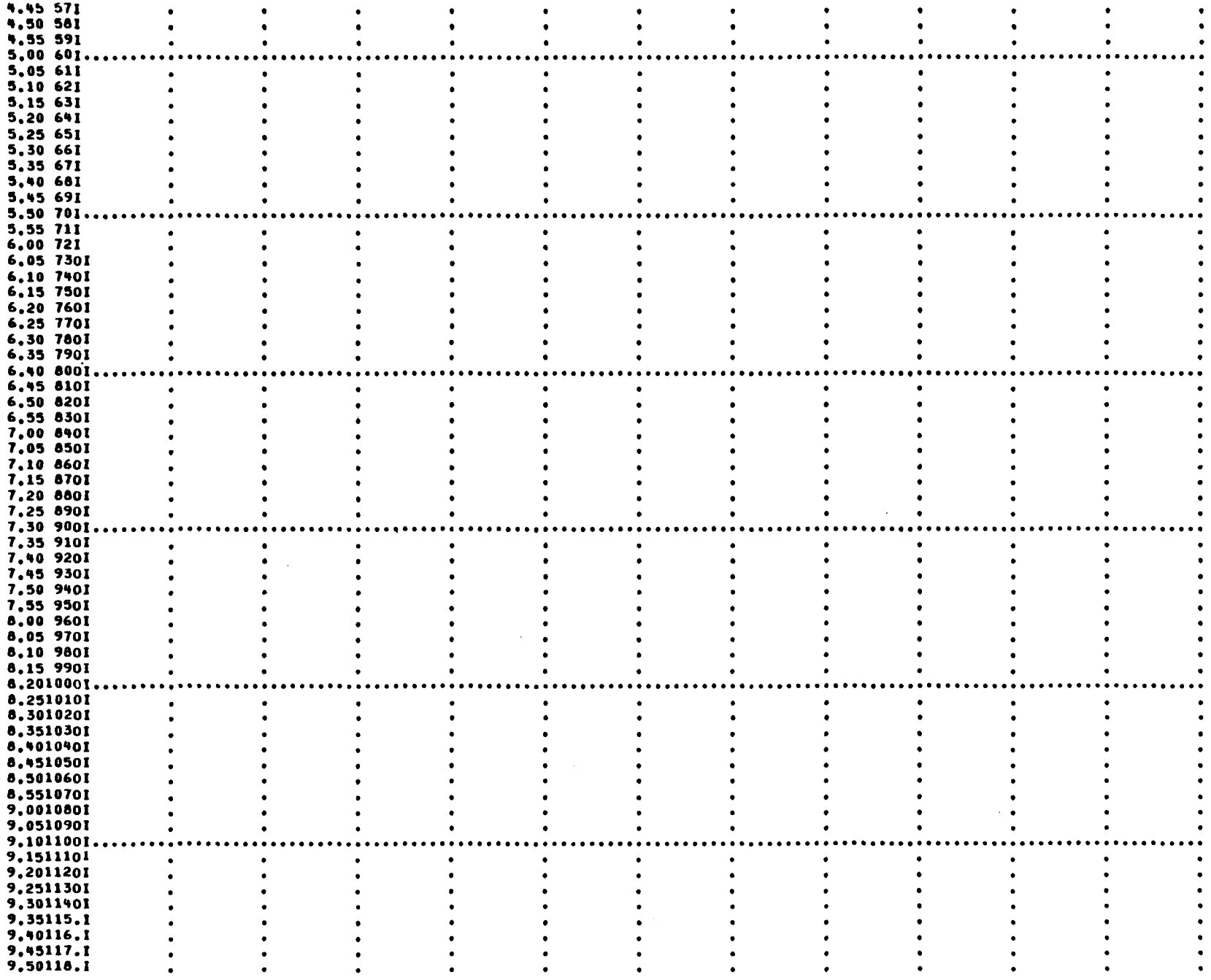


PLATE D-20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4.55 591
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5.05 611
5.10 621
5.15 631
5.20 641
5.25 651
5.30 661
5.35 671
5.40 681
5.45 691
5.50 701
5.55 711
6.00 721
6.05 730I
6.10 740I
6.15 750I
6.20 760I
6.25 770I
6.30 780I
6.35 790I
6.40 800I
6.45 810I
6.50 820I
6.55 830I
7.00 840I
7.05 850I
7.10 860I
7.15 870I
7.20 880I
7.25 890I
7.30 900I
7.35 910I
7.40 920I
7.45 930I
7.50 940I
7.55 950I
8.00 960I
8.05 970I
8.10 980I
8.15 990I
8.2010001
8.2510101
8.3010201
8.3510301
8.4010401
8.4510501
8.5010601
8.5510701
9.0010801
9.0510901
9.1011001
9.1511101
9.2011201
9.2511301
9.3011401
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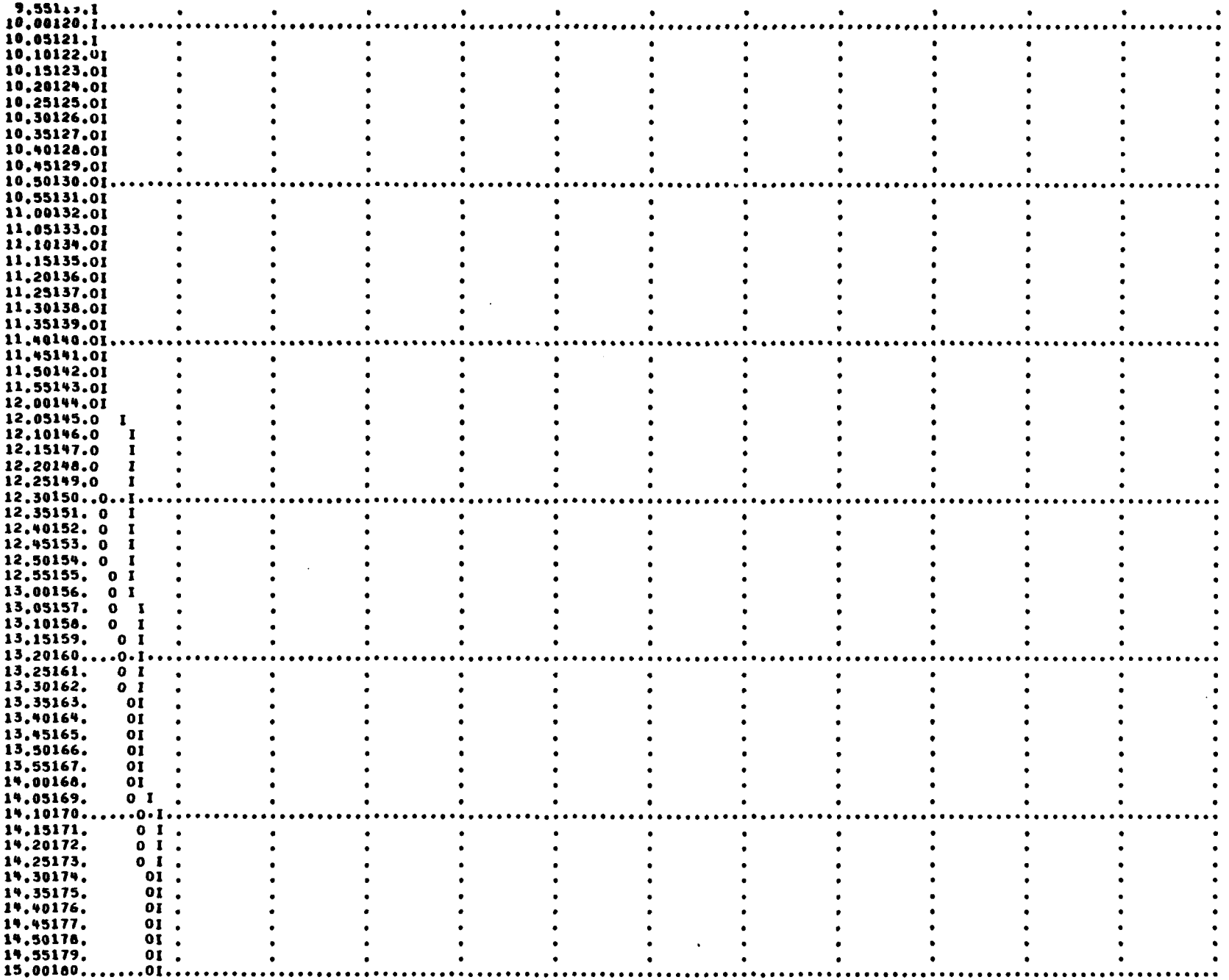
9.40116.1
9.45117.1
9.50118.1

PLATE D-21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10.15123.0I
10.20124.0I
10.25125.0I
10.30126.0I
10.35127.0I
10.40128.0I
10.45129.0I
10.50130.0I
10.55131.0I
11.00132.0I
11.05133.0I
11.10134.0I
11.15135.0I
11.20136.0I
11.25137.0I
11.30138.0I
11.35139.0I
11.40140.0I
11.45141.0I
11.50142.0I
11.55143.0I
12.00144.0I
12.05145.0 I
12.10146.0 I
12.15147.0 I
12.20148.0 I
12.25149.0 I
12.30150..0..I
12.35151. 0 I
12.40152. 0 I
12.45153. 0 I
12.50154. 0 I
12.55155. 0 I
13.00156. 0 I
13.05157. 0 I
13.10158. 0 I
13.15159. 0 I
13.20160....0.I
13.25161. 0 I
13.30162. 0 I
13.35163. 0I
13.40164. 0I
13.45165. 0I
13.50166. 0I
13.55167. 0I
14.00168. 0I
14.05169. 0 I
14.10170.....0.I
14.15171. 0 I
14.20172. 0 I
14.25173. 0 I
14.30174. 0I
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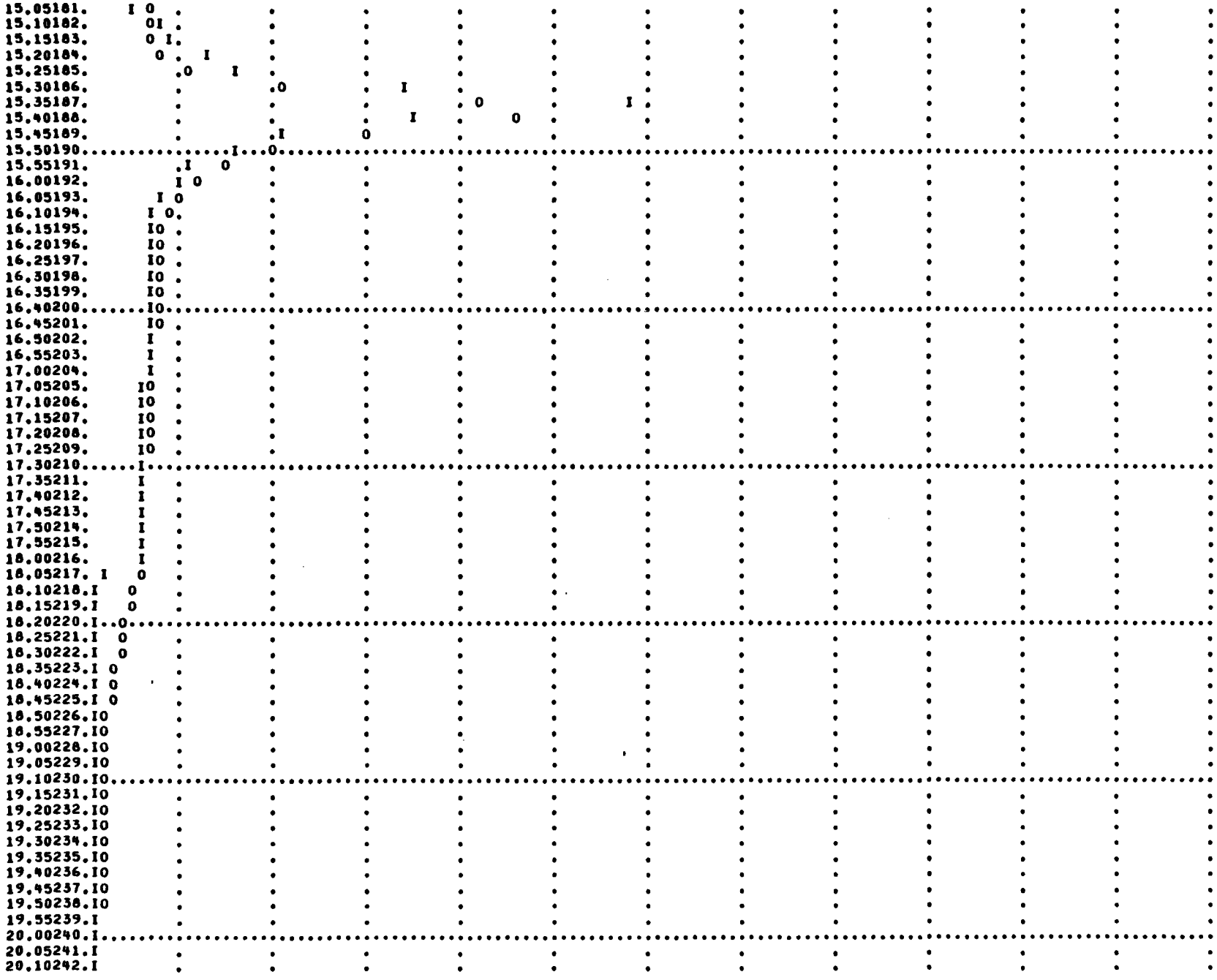
PLATE D-22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15.20184. O . I
15.25185. .O I
15.30186. .O I
15.35187. O I
15.40188. I O
15.45189. .I O
15.50190. I..O
15.55191. .I O
16.00192. I O
16.05193. I O
16.10194. I O.
16.15195. IO
16.20196. IO
16.25197. IO
16.30198. IO
16.35199. IO
16.40200. IO
16.45201. IO
16.50202. I
16.55203. I
17.00204. I
17.05205. IO
17.10206. IO
17.15207. IO
17.20208. IO
17.25209. IO
17.30210. I
17.35211. I
17.40212. I
17.45213. I
17.50214. I
17.55215. I
18.00216. I
18.05217. I O
18.10218.I O
18.15219.I O
18.20220.I..O
18.25221.I O
18.30222.I O
18.35223.I O
18.40224.I O
18.45225.I O
18.50226.IO
18.55227.IO
19.00228.IO
19.05229.IO
19.10230.IO
19.15231.IO
19.20232.IO
19.25233.IO
19.30234.IO
19.35235.IO
19.40236.IO
19.45237.IO
19.50238.IO
19.55239.I
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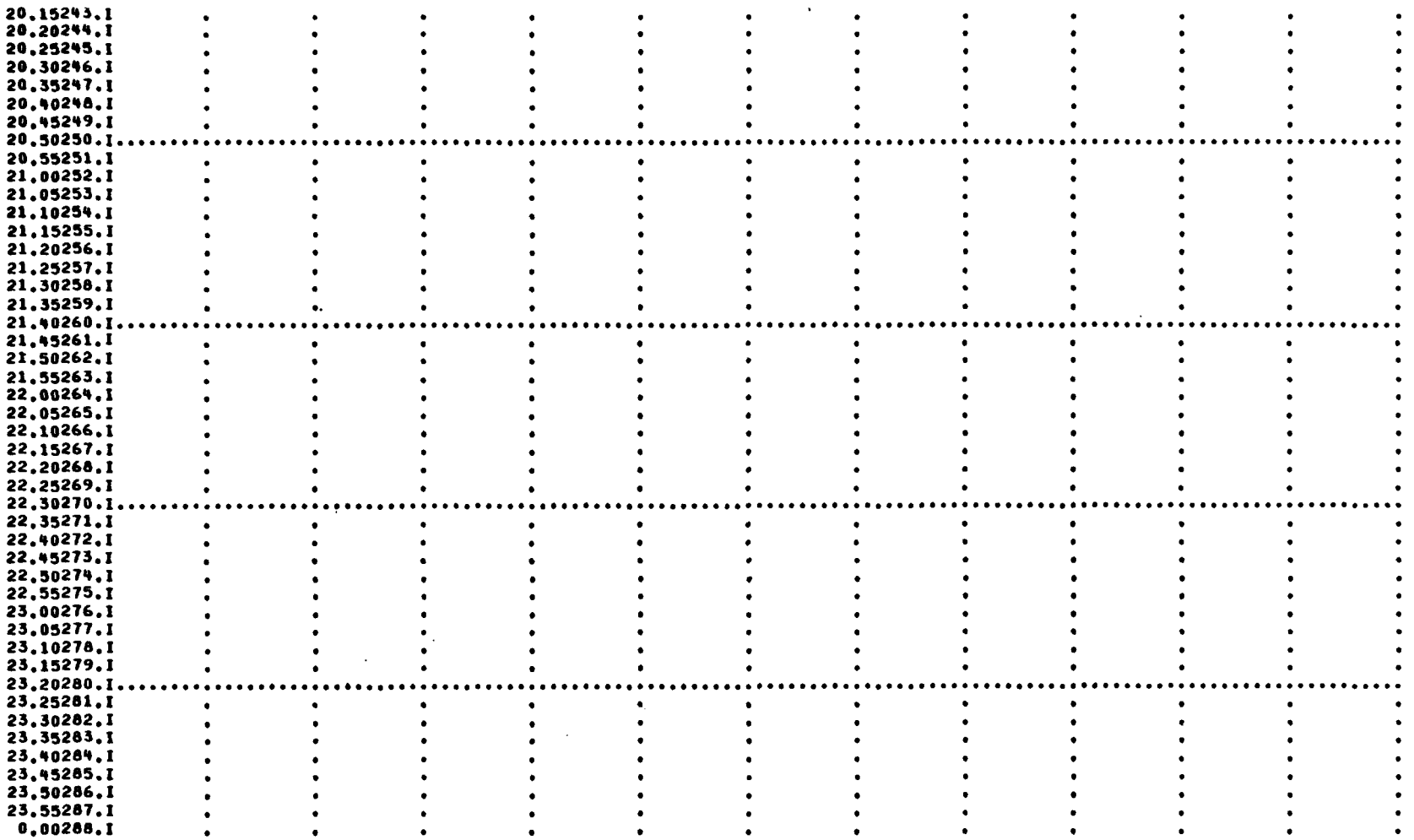
20.05241.I
20.10242.I

PLATE D-23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20.40248.I
20.45249.I
20.50250.I
20.55251.I
21.00252.I
21.05253.I
21.10254.I
21.15255.I
21.20256.I
21.25257.I
21.30258.I
21.35259.I
21.40260.I
21.45261.I
21.50262.I
21.55263.I
22.00264.I
22.05265.I
22.10266.I
22.15267.I
22.20268.I
22.25269.I
22.30270.I
22.35271.I
22.40272.I
22.45273.I
22.50274.I
22.55275.I
23.00276.I
23.05277.I
23.10278.I
23.15279.I
23.20280.I
23.25281.I
23.30282.I
23.35283.I
23.40284.I
23.45285.I
23.50286.I
23.55287.I
0.00288.I

PLATE D-24

•OVN•

STATION 000002, PLAN 1, RATIO 9 PMF

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	3.	3.	3.	4.	4.
5.	5.	5.	6.	6.	7.	7.	7.	8.	9.
15.	17.	20.	23.	27.	30.	33.	36.	39.	41.
44.	47.	48.	48.	48.	48.	48.	48.	48.	49.
52.	55.	58.	60.	62.	65.	67.	69.	71.	73.
75.	77.	79.	83.	87.	91.	94.	97.	99.	102.
104.	106.	108.	109.	111.	112.	113.	114.	115.	116.
117.	117.	118.	119.	130.	154.	178.	201.	222.	249.
273.	292.	309.	344.	374.	390.	414.	450.	471.	482.
487.	489.	490.	491.	491.	491.	492.	492.	521.	572.
599.	611.	615.	617.	617.	616.	618.	618.	619.	619.
557.	555.	657.	825.	1075.	1874.	3634.	3722.	2246.	1512.
1119.	882.	746.	646.	605.	589.	584.	582.	581.	581.
581.	581.	581.	581.	551.	502.	477.	465.	460.	458.
457.	457.	457.	457.	457.	457.	369.	291.	255.	223.
204.	188.	174.	161.	149.	138.	128.	120.	112.	105.
99.	93.	88.	84.	80.	78.	77.	75.	74.	73.
72.	71.	70.	69.	68.	67.	66.	65.	65.	64.
63.	63.	62.	61.	61.	60.	59.	59.	58.	58.
57.	57.	57.	56.	56.	55.	55.	55.	54.	54.
54.	53.	53.	53.	53.	52.	52.	52.	52.	51.
51.	51.	51.	51.	50.	50.	50.	50.		

STORAGE

65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	65.	65.	65.	65.	65.	65.	65.	65.
65.	65.	66.	66.	66.	66.	66.	66.	66.	66.
66.	66.	66.	66.	66.	66.	66.	66.	66.	66.
67.	67.	67.	67.	67.	67.	67.	67.	67.	67.
67.	67.	68.	68.	68.	69.	69.	70.	71.	71.
72.	72.	73.	74.	74.	75.	75.	76.	77.	77.
78.	79.	79.	80.	80.	81.	82.	82.	83.	83.
84.	84.	84.	85.	85.	86.	86.	87.	87.	88.
88.	89.	89.	89.	90.	90.	91.	91.	91.	92.
92.	92.	92.	93.	93.	93.	93.	94.	94.	94.
94.	94.	94.	94.	94.	94.	95.	95.	95.	95.
95.	95.	95.	95.	96.	97.	99.	100.	101.	103.
104.	104.	105.	106.	106.	106.	106.	107.	107.	107.
107.	107.	107.	107.	107.	107.	107.	107.	107.	107.
108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
107.	107.	108.	109.	110.	114.	120.	121.	115.	112.
111.	109.	109.	108.	108.	108.	108.	108.	108.	108.
108.	108.	108.	108.	107.	107.	107.	107.	107.	107.
107.	107.	107.	107.	107.	107.	106.	104.	103.	101.
100.	99.	98.	98.	97.	96.	96.	95.	95.	94.
94.	93.	93.	93.	93.	92.	92.	92.	92.	92.

91.	91.	91.	91.	91.	91.	90.	90.	90.	90.
90.	90.	90.	90.	90.	89.	89.	89.	89.	89.
89.	89.	89.	89.	89.	89.	89.	89.	88.	88.
88.	88.	88.	88.	88.	88.	88.	88.	88.	88.
88.	88.	88.	88.	88.	88.	88.	88.		

STAGE

100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4
100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.4	100.5
100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5
100.5	100.5	100.5	100.6	100.6	100.6	100.6	100.6	100.6	100.6
100.6	100.6	100.6	100.7	100.7	100.7	100.7	100.7	100.7	100.7
100.7	100.7	100.8	100.8	100.9	101.0	101.0	101.1	101.2	101.3
101.4	101.4	101.5	101.6	101.7	101.8	101.9	102.0	102.0	102.1
102.2	102.3	102.4	102.4	102.5	102.6	102.7	102.7	102.8	102.9
102.9	103.0	103.0	103.1	103.1	103.2	103.3	103.3	103.4	103.4
103.5	103.5	103.6	103.6	103.7	103.7	103.8	103.8	103.8	103.9
103.9	104.0	104.0	104.0	104.1	104.1	104.1	104.1	104.1	104.2
104.2	104.2	104.2	104.2	104.2	104.2	104.2	104.2	104.3	104.3
104.3	104.3	104.3	104.3	104.4	104.5	104.7	104.9	105.0	105.1
105.2	105.3	105.4	105.5	105.5	105.5	105.5	105.6	105.6	105.6
105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6
105.7	105.7	105.7	105.7	105.7	105.7	105.7	105.7	105.7	105.7
105.6	105.6	105.7	105.8	105.9	106.3	106.9	106.9	106.4	106.1
105.9	105.8	105.8	105.7	105.7	105.7	105.7	105.6	105.6	105.6
105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6	105.6
105.6	105.6	105.6	105.6	105.6	105.6	105.5	105.3	105.2	105.0
104.9	104.8	104.7	104.6	104.5	104.4	104.4	104.3	104.2	104.2
104.1	104.1	104.1	104.0	104.0	104.0	104.0	103.9	103.9	103.9
103.9	103.8	103.8	103.8	103.8	103.8	103.8	103.7	103.7	103.7
103.7	103.7	103.7	103.7	103.6	103.6	103.6	103.6	103.6	103.6
103.6	103.6	103.6	103.6	103.5	103.5	103.5	103.5	103.5	103.5
103.5	103.5	103.5	103.5	103.5	103.5	103.5	103.5	103.5	103.5
103.5	103.5	103.5	103.5	103.4	103.4	103.4	103.4		

PEAK OUTFLOW IS 3722. AT TIME 15.67 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3722.	668.	201.	201.	57791.
CMS	105.	19.	6.	6.	1636.
INCHES		24.09	28.94	28.94	28.94
MM		611.98	735.08	735.08	735.08
AC-FT		331.	398.	398.	398.
THOUS CU M		409.	491.	491.	491.

OVF

STATION000002

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

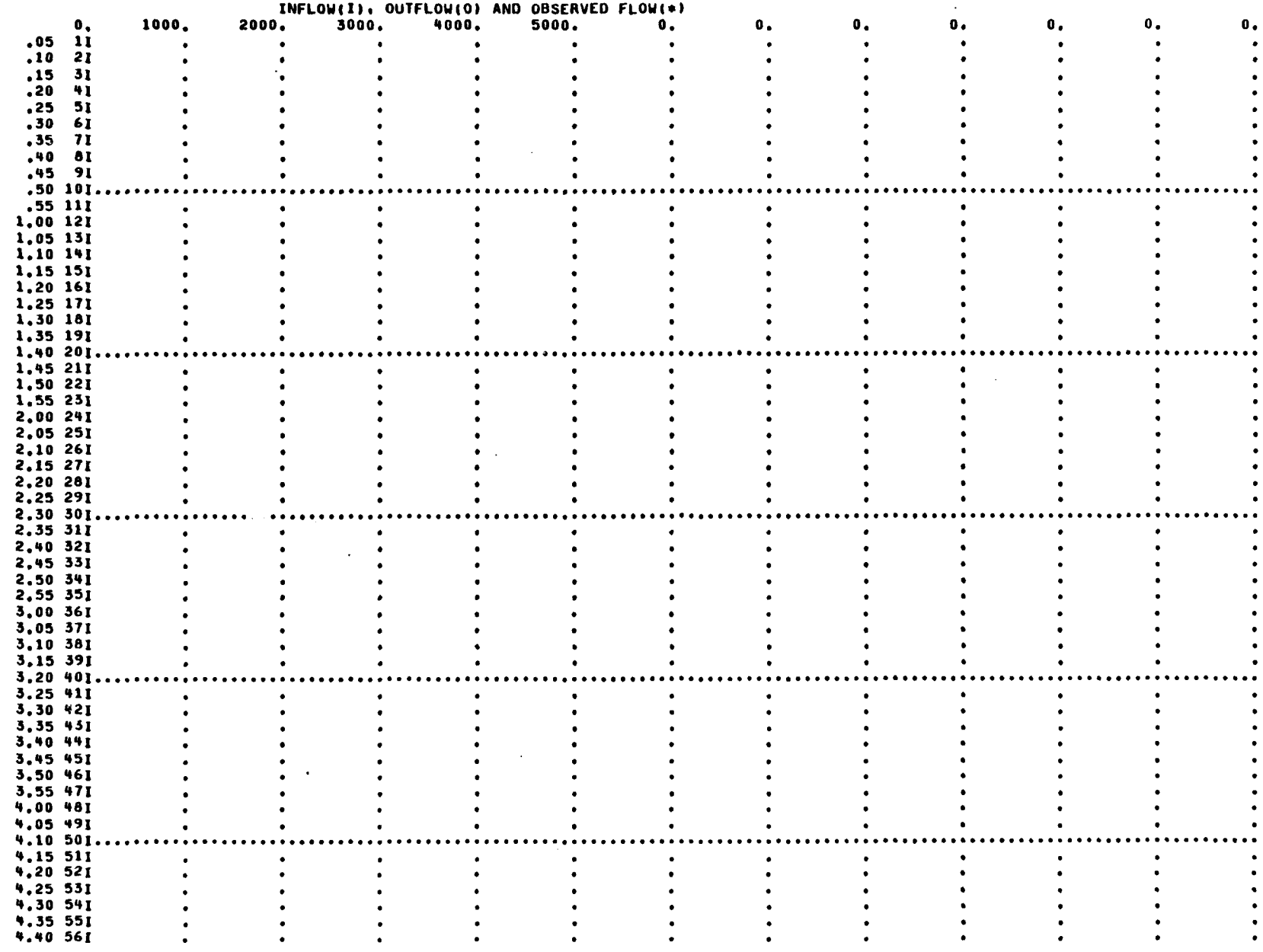
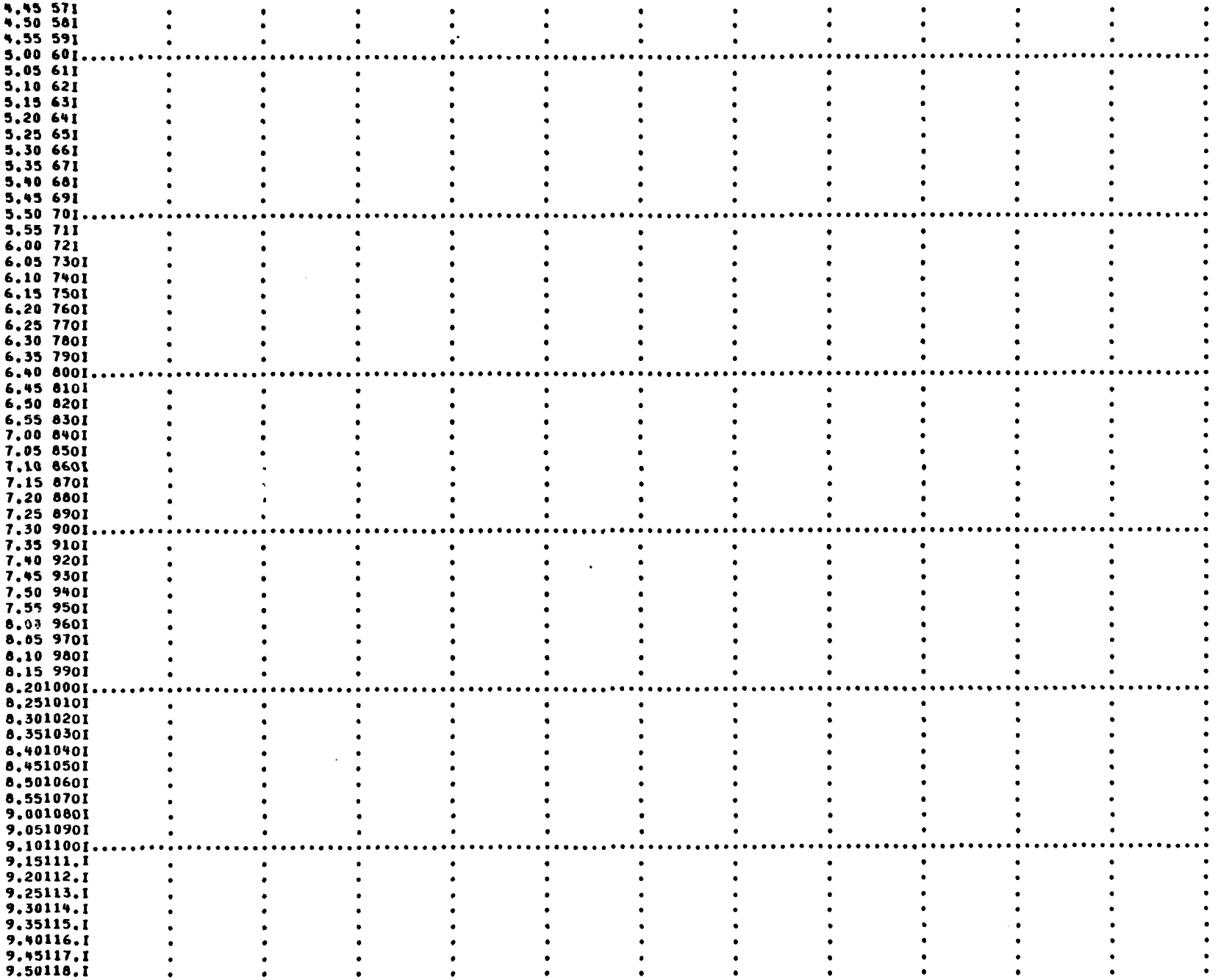


PLATE D-27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5.10 62I
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5.20 64I
5.25 65I
5.30 66I
5.35 67I
5.40 68I
5.45 69I
5.50 70I
5.55 71I
6.00 72I
6.05 73OI
6.10 74OI
6.15 75OI
6.20 76OI
6.25 77OI
6.30 78OI
6.35 79OI
6.40 80OI
6.45 81OI
6.50 82OI
6.55 83OI
7.00 84OI
7.05 85OI
7.10 86OI
7.15 87OI
7.20 88OI
7.25 89OI
7.30 90OI
7.35 91OI
7.40 92OI
7.45 93OI
7.50 94OI
7.55 95OI
8.00 96OI
8.05 97OI
8.10 98OI
8.15 99OI
8.201000I
8.251010I
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8.351030I
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8.451050I
8.501060I
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9.051090I
9.101100I
9.15111.I
9.20112.I
9.25113.I
9.30114.I
9.35115.I
9.40116.I
9.45117.I
9.50118.I

PLATE D-28

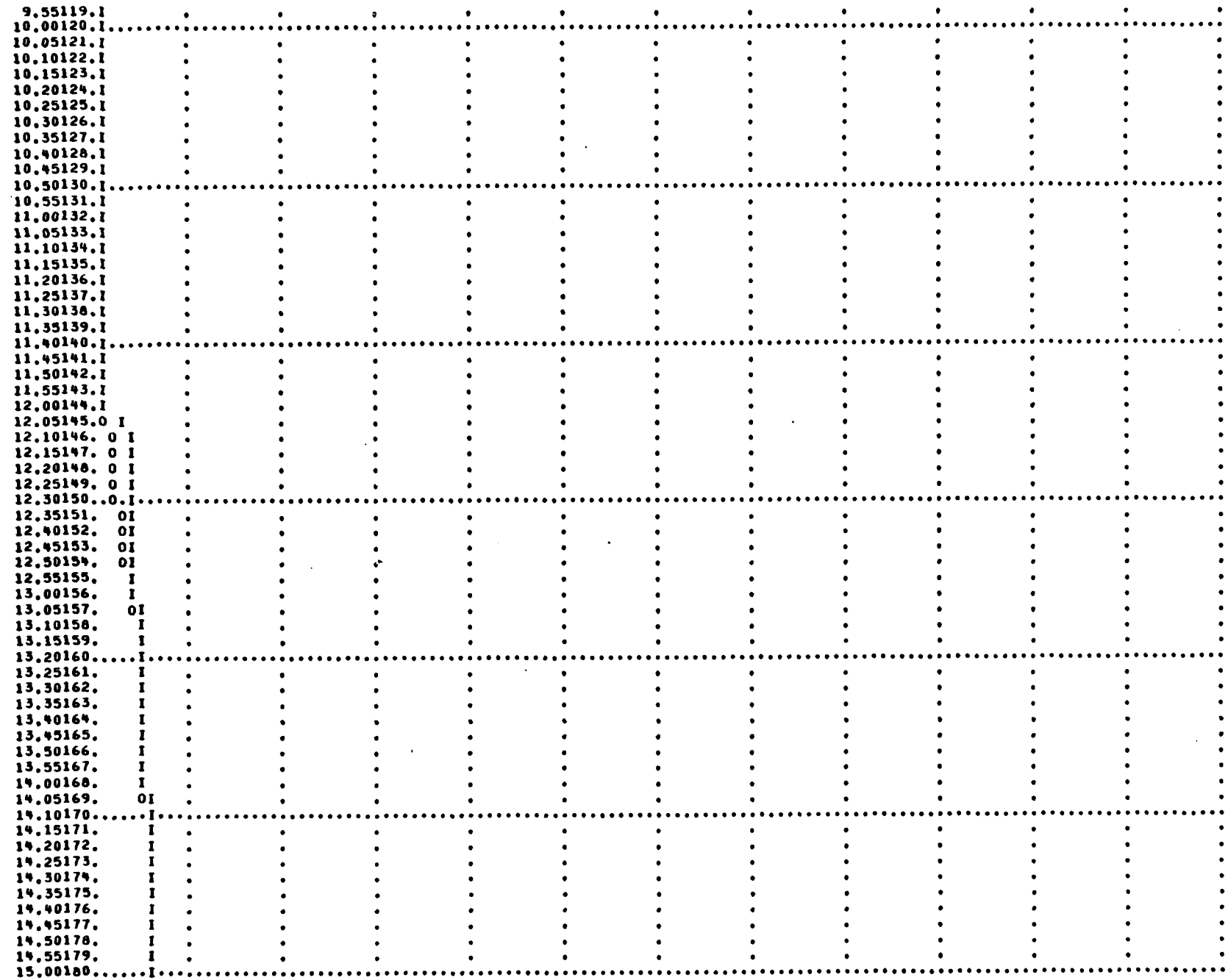
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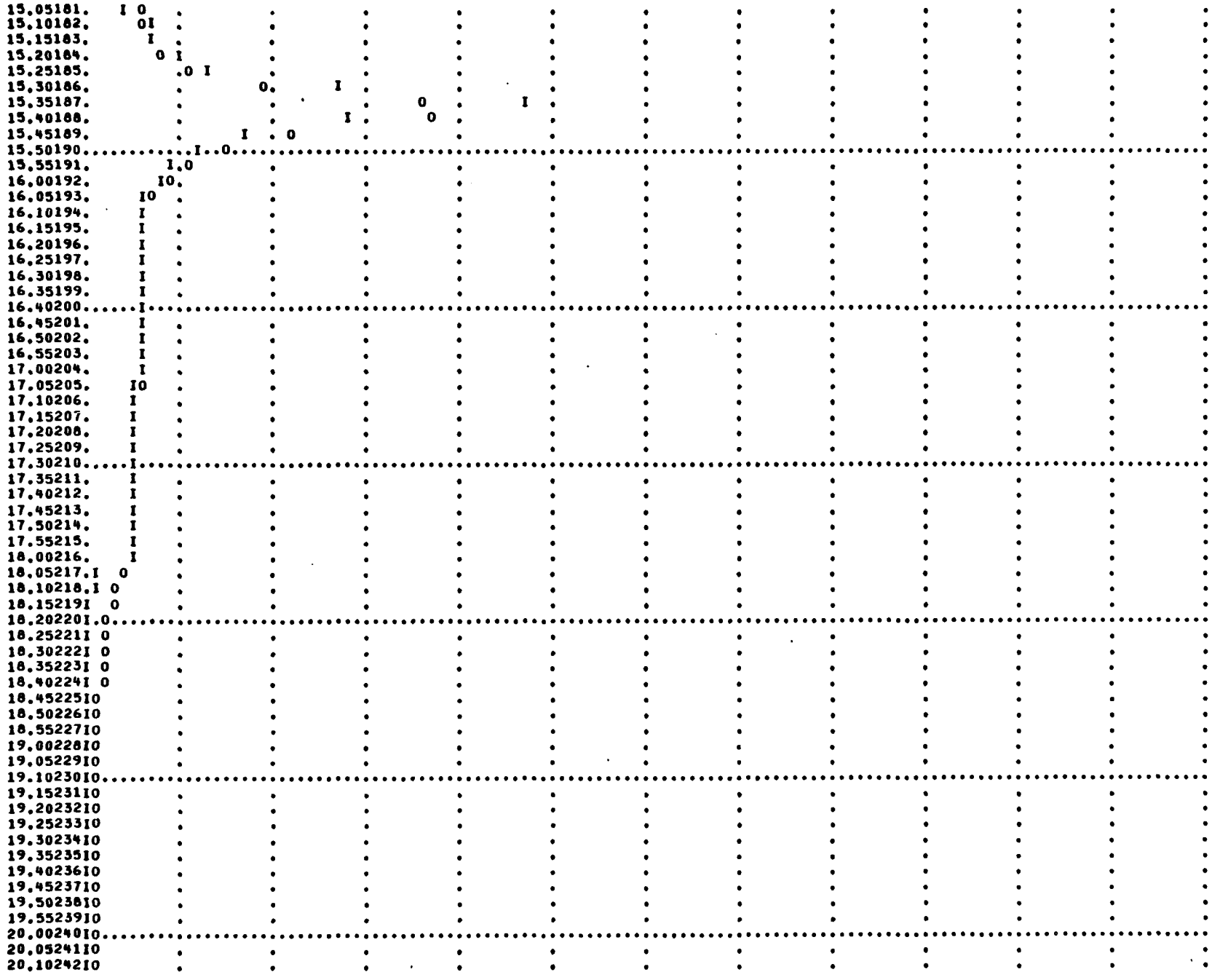
PLATE D-29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19.05229
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19.15231
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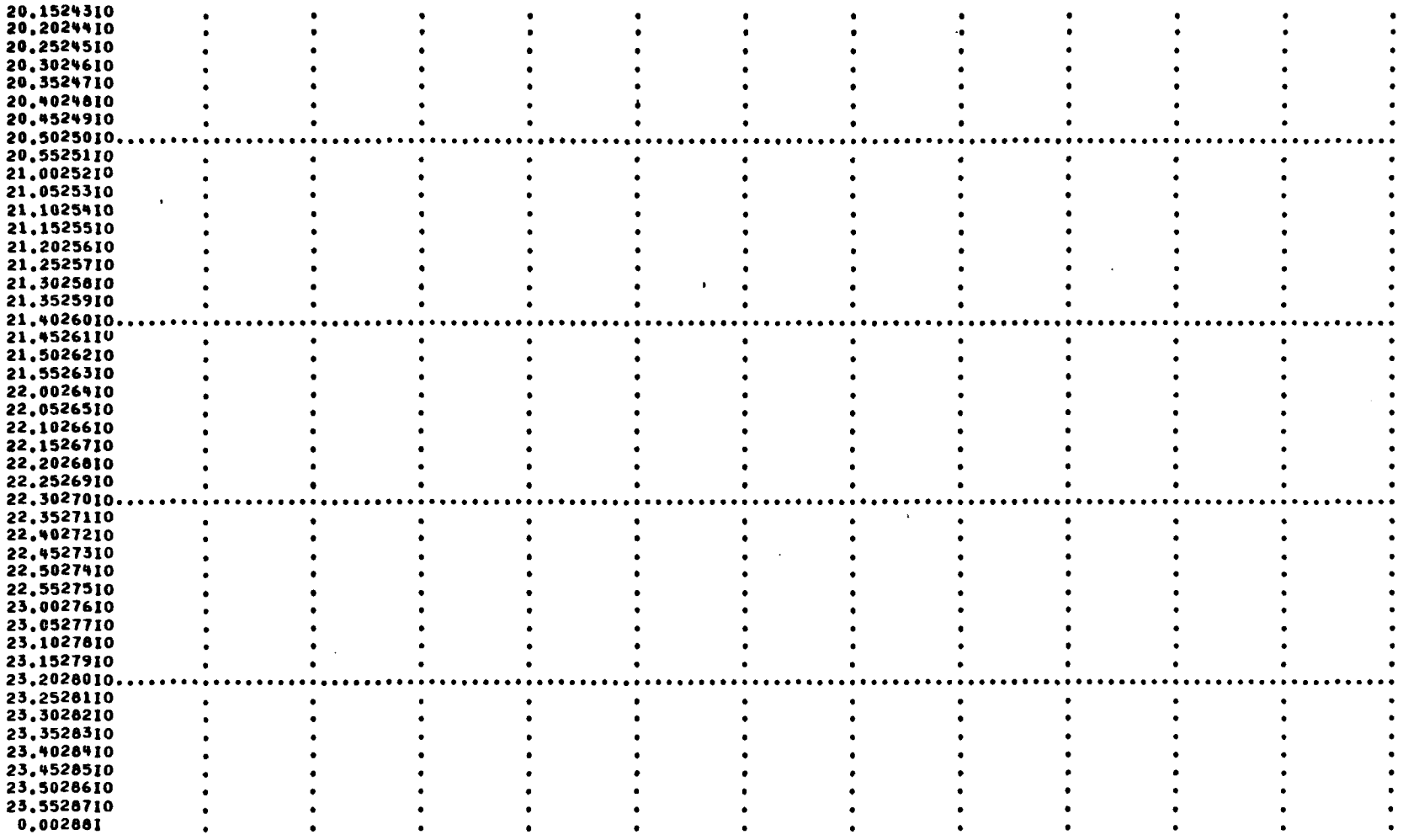
PLATE D-30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21.2025610
21.2525710
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21.3525910
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22.2026810
22.2526910
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23.3528310
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23.5028610
23.5528710
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PLATE D-31

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .25	RATIO 4 .30	RATIO 5 .35	RATIO 6 .40	RATIO 7 .45	RATIO 8 .50	RATIO 9 1.00
HYDROGRAPH AT	000001	.26 (.67)	1	466. (13.19)	932. (26.38)	1165. (32.98)	1398. (39.57)	1630. (46.17)	1863. (52.76)	2096. (59.36)	2329. (65.95)	4658. (131.91)
ROUTED TO	000002	.26 (.67)	1	61. (1.73)	285. (8.07)	559. (15.83)	954. (27.01)	1226. (34.73)	1455. (41.21)	1654. (46.85)	1847. (52.29)	3722. (105.40)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	100.40	100.40	105.40
STORAGE	65.	65.	105.
OUTFLOW	0.	0.	310.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	103.65	0.00	90.	61.	0.00	16.08	0.00
.20	105.29	0.00	104.	285.	0.00	15.83	0.00
.25	105.63	.23	107.	559.	.33	15.67	0.00
.30	105.87	.47	110.	954.	.50	15.67	0.00
.35	106.00	.60	111.	1226.	.58	15.67	0.00
.40	106.10	.70	112.	1455.	.67	15.67	0.00
.45	106.18	.78	113.	1654.	.83	15.67	0.00
.50	106.25	.85	114.	1847.	1.08	15.67	0.00
1.00	106.88	1.48	121.	3722.	5.33	15.67	0.00

PLATE D-33